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MEMORY FOR EVENTS IN NARRATIVE DISCOURSE:
THE ROLE OF TYPICALITY, SPECIFICITY,
AND RELEVANCE

University — Université
U. of ALBERTA

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée
M.Sc.

Year this degree conferred — Année d'obtention de ce grade
1984

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Memory for Events in Narrative Discourse: The Role of Typicality, Specificity, and Relevance

by

© Bruce D. Galenza

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF

MASTER OF SCIENCE

DEPARTMENT OF PSYCHOLOGY

EDMONTON, ALBERTA

FALL 1984

THE UNIVERSITY OF ALBERTA

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DEGREE FOR WHICH THESIS WAS PRESENTED: Master of Science

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Dedicated

to

Joseph Rempel

Abstract

Structural models have been advanced describing how schematically processed memory may be stored; the Script Pointer Plus Tag model by Graesser and his associates, and the Partial Copy model by Bower, Black and Turner. These models are shown to be incomplete in that they take only small subsets of possible stimulus materials into account. What other writers have referred to as "typicality" is shown to be two different dimensions; the probability of generic representation in the script, and given that representation, the probability of a particular perceptual instantiation. Relevance also is seen as two dimensions; a dimension inherent in the structure of the script, and a dimension dependent upon the purpose to which the script is applied. In this study, memory is tested for a larger range of stimulus sentences, differentiated on three dimensions: typicality, the probability of an argument's instantiation; relevance, the importance to the goals of carrying out the script; and specificity, the amount of detailed information in the stimulus sentence. In texts describing everyday activities, memory is found to be better for atypical than for typical stimuli, and better for specifically stated than for generally stated stimuli. Results of the relevance manipulation are inconclusive, and relevance of discourse information is concluded to be different between the perspectives of an actor in, and a reader of, narrative discourse. An alternate model is proposed, the Copy Plus Instantiation model, that deals with a wider range of stimuli information and accounts more fully for the data.

Acknowledgements

I would like to thank Al Dobbs, Pete Dixon and Gary Prideaux for their thoughts, suggestions and criticisms, and their assistance as this effort slowly took shape.

I would especially like to express my gratitude to Alinda Friedman, who became as excited about this project as I did, contributed a great amount of her time and energy, and introduced me to the joys and rigors of scientific investigation and professional research.

Special thanks to Julie Lloyd, for valuable comments, and for keeping it all organized.

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INTRODUCTION

In an everyday situation like eating in a restaurant, people know how to use menus, interact with waitresses, and exchange money for food in order to successfully fulfill their goal of satiating their hunger. These decisions are said to be made on the basis of memory representations known as "schemas," which contain knowledge of, and procedures for, actions in various situations (Friedman, 1979; Hastie, 1981; Mandler, 1978; Minsky, 1975; Rumelhart, 1980; Rumelhart & Ortony, 1977; Schank & Abelson, 1977). Some investigators have studied schematic knowledge about objects and scenes (Brewer & Treyens, 1981) or pictures of scenes (Friedman, 1979; Goodman, 1980; Hock, Romanski, Galie & Williams, 1978; Mandler, 1978; Mandler & Johnson, 1976; Mandler & Ritchie, 1977). Others have studied knowledge about people and the behaviour they exhibit (Hastie, 1981; Hastie & Kumar, 1979; Srull, 1981; Woll & Graesser, 1980). Still others have examined the effects of schema-directed processing on comprehension and memory for reading simple stories (Anderson & Pichert, 1978; Johnson & Mandler, 1980; Mandler & Johnson, 1977; Thorndyke, 1977), reading a series of actions in prose form (Bower, Black & Turner, 1979; Lichtenstein & Brewer, 1978; Schank & Abelson, 1977), listening to taped text (Graesser, Gordon, & Sawyer, 1979; Graesser, Woll, Kowalski & Smith, 1980; Smith & Graesser, 1981), or viewing filmed actions (Lichtenstein & Brewer, 1978).

A schema is most generally considered to be a cognitive structure organizing a body of information. This information consists of concepts and procedures that have been perceived to be spatially and temporally contiguous through everyday experience (Bower, Black & Turner, 1979; Friedman, 1979; Goodman, 1980; Mandler, 1978). The data base is comprised of information about what objects and events occur together, along with information about their functions and the activities usually

associated with them (Hastie, 1980; Rumelhart, 1980).

The objects, actions, or events represented in a particular script or schema (by what has been commonly termed arguments, terminals, or slots) lie along a continuum of probability or typicality of occurrence (Graesser et al, 1979; Graesser et al, 1980; Mandler, 1978; Rumelhart & Ortony, 1977). Minsky (1975) envisions a hierarchical network in which the top levels are fixed; for example, a place must offer prepared food in exchange for money to be defined as a restaurant. Subordinate to these fixed arguments are arguments for objects, actions or events that do not have to be present, although the a priori probability is quite high that they will be. For example, although one would usually sit down to eat in a restaurant, one could eat while walking away from a take-out restaurant. This instance is simply not as "good" a restaurant as it could be.

Aside from obligatory objects or events, there can be slots in the representation for optional or non-obligatory arguments; for example, there might be a slot for "ordering dessert" in a restaurant script. Objects that would instantiate this sort of slot can also vary in probability. Thus, a schema not only specifies what objects or events are usually spatially and temporally contiguous, but also provides a basis for judging that something is unusual or out of place (Minsky, 1975; Simon, 1975).

The actions in a particular schema also vary along a continuum of specificity. In a hierarchical system, the arguments of a schema are also schemas; that is, schemas become more specific as they become more embedded (Bobrow & Norman, 1975; Friedman, 1979; Mandler, 1978; Minsky, 1975; Rumelhart & Ortony, 1977). Schank and Abelson (1977) have differentiated four levels of specificity: themes, goals, plans, and scripts. These are schemas that range, for example, from a general theme of "satisfying one's hunger" through the goals and plans of how this may be accomplished, to the more specific script containing the objects, events

and prescribed behaviour particular to restaurants.

The Role of Schemas in Perception

Normally, the appropriate schema for a given environment is activated by anticipation from what has occurred beforehand. It is only when a situation runs counter to expectations or when one has no idea of what one's perceptual environment will be in the next instant that activation may be purely event-driven. Schema activation is probably initially "bottom-up" or event-driven (Bobrow & Norman, 1975; Minsky, 1975; Rumelhart, 1980; Rumelhart & Ortony, 1977). The choice of which schema is activated may thus depend upon which objects or events are identified first; if they are obligatory for a particular schema, that is the schema that will probably be activated (Friedman, 1979).

Taylor and Crocker (1980) have pointed out a few of the factors that may influence the event-driven choice of a particular schema, applying Kahneman and Tversky's (1972) representative and availability heuristics. They describe the choice as being a function of the degree to which the identified objects are representative of a particular schema and the relative frequency of use of an individual's schemas. A criterion is reached such that a schema is activated, presumably by either the number of arguments instantiated or by the instantiations of enough of the more heavily weighted or diagnostic arguments.

When a schema becomes activated, processing may then become top-down or conceptually driven. The objects and events that typically comprise the environment need not be dealt with individually or even consciously, thereby freeing attention to be directed toward matters that are more interesting or of immediate importance. The effect of schema-directed processing on perception can be studied through measurements of the time involved in the perception of stimuli. Bower et al., (1979) found that reading time for texts decreased when the ordering of sentences was closer to the canonical form of an activity. For example, eating in a

restaurant normally follows ordering the food, and it was found that when the text followed this sequence, reading was faster. Rumelhart (1980) showed that comprehension of stories was expedited when the appropriate schema was activated by priming prior to reading. Biederman (1979) showed that detection and identification of objects in scenes was slower when the objects violated basic relationships of position and organization. Similarily, Friedman (1979) found that initial eye fixation time was shorter for expected objects than for unexpected objects in pictures of familiar scenes. It is apparent that information that matches the arguments of a schema is processed faster than is incongruent information.

The Role of Schemas in the Formation of Memory

The majority of studies investigating the effects of schema-directed processing have concentrated on the product of the process--the organization and content of memory. Although schematic knowledge can be gained through personal experience, it can exist and be applied independently of the memory for the episode in which it was learned. Schematic knowledge is the interpreter through which perceptual experience passes in the formation of episodic memory. Thus, its stamp is left upon the memory representation of the episode that can later be studied through recall and recognition.

Scripts appear to include a range of values that are acceptable as instantiations to each terminal. As perceptual information is processed, it is compared with these values; instantiations that fall within the acceptable range are stored normally in, or "bound to," the terminals of the episodic trace (Rumelhart & Ortony, 1977). Those that are still considered argument instantiations but have a lower probability associated with them are also similarly stored, but may be processed to a greater extent due to their atypical nature (Friedman, 1979). That is, typical instantiations may be processed automatically by the activated schema, requiring little in the way of resources for both processing and storage, while

atypical instantiations may require more resources to be processed.

The generic schema may also be used to fill in values of the episodic trace if perceptual experience has not done so (e.g. Brewer & Treyens, 1981). This "filling in" has been termed "default processing" (Bower, et.al., 1979; Mandler, 1978; Minsky, 1975; Rumelhart & Ortony, 1977) and appears to be directed by considerations of typicality and one's unique past history (Friedman, 1979; Graesser & Nakamura, in press; Minsky, 1975). Binding specific information to the terminal nodes, whether by perceptual experience or default, appears not to be permanent; as time after perception increases, the specific information fades, leaving the generic terminal. This results in the observed inability to discriminate between veridical perceptual experiences and typical objects and events that were not actually perceived (Bower, Black and Turner, 1979; Graesser, Gordon & Sawyer, 1979; Graesser, Woll, Kowalski & Smith, 1980), as well as the observed reconstructive nature of recall (Mandler, Johnson & DeForest, 1976; Mandler, 1978).

Specificity, Typicality and Relevance of Arguments and Instantiations

The term "specificity" has been rather loosely applied to hierarchical levels of schemas in semantic memory. Specificity, however, can also refer to the detailed information of an instantiation of a schema's argument, especially in the area of text processing. Schank and Abelson (1977) point out that scripts themselves vary in specificity; for example, eating in a restaurant, in a sea-food restaurant, or in a sea-food restaurant down by the docks. This point of view assumes a different script for each of the possibly infinite number of levels of specificity. A more parsimonious view would be to postulate a single script at the base level of "eating in a restaurant" and assume varying specificity of the argument's instantiations rather than of the scripts themselves. That is, the argument for "choosing a restaurant" can be filled with the instantiation of "a restaurant", "a sea-food restaurant," or a particular favourite sea-food restaurant. This paper will use

"specificity" in the latter sense, meaning the amount of detailed information present in an episodic instantiation from written text.

Similar to specificity, "typicality" can also be applied to information at both the schematic and instantiation levels. An instantiation is generically or schematically typical if it matches a typical generic argument; ordering food in a restaurant is a typical argument within a restaurant script while dropping a fork is not. General statements can therefore be rated along a scale of probability of occurrence within the semantic schema. The episodic instantiations of a terminal at a more specific level, for example what is ordered, can also be rated along a scale of typicality. Ordering steak in a nice restaurant is typical, while a hamburger with a side of fries is more atypical. But ordering a hamburger is still a generically typical occurrance because it matches the generic argument of ordering food. The remainder of this paper will use "specific typicality" to mean the probability of occurrence of specifically-stated actions and events; actions and events that, in their generic form, would be reasonably included within a particular processing script. "General typicality" refers to the probability of the general form being included in the script.

The distinction between generic arguments and specific instantiations of those arguments in narrative discourse finds precedence in literature dealing with schematic processing of pictures, e.g., Friedman's (1979) episodic-descriptive distinction, Goodman's (1980) presence-appearance distinction, and Mandler and Parker's (1976) distinction between inventory and descriptive information. In these analyses, it is pointed out that one can test for whether or not an object had been presented earlier, or if it had, what it looked like. Similarly, in memory for text, one can test for whether a general action had occurred, or for the specific details of that action; for example, whether or not a patron ordered food in a restaurant, and if so, what was ordered.

A third dimension along which information can be classified is that of "relevance," identified by Goodman (1980) as being separate from, but generally confounded with typicality. Her definition of relevance is the importance of an object or action to the theme of the script; that is, the necessity of that object or action to fulfilling the overall goal or plan to which the script is directed. Thus, if we define the goals of going to a restaurant to be eating and socializing, it is relevant to these goals to order food and talk to one's date.

The dimension of relevance appears to be separable from typicality, for actions can be typical and irrelevant, like toying with a fork, or they can be atypical and relevant, like ordering an unusual entree. In addition, relevance may be a dimension defined in relation to the purposes of whomever is processing the information at hand. Thus, if the processor is actively involved in the action taking place, the information that is relevant is an action or event that contributes to the fulfillment of his or her current goal. On the other hand, if the processor is an observer of the action, his or her purposes may be entirely different. For example, the actions of a restaurant patron could be watched by a thief planning to rob the patron later, to whom it is relevant how expensive a dish is ordered, but immaterial if the food is well-prepared.

In narrative discourse, there appears to be a relevance dimension inherent in the text and an external relevance defined by the instructions to the subject. These two dimensions may be equal when the observer is reading or viewing the stimulus with the sole purpose of understanding the information being presented. In this circumstance, what is relevant to the ongoing goal-directed action in a text may also be relevant to someone who is trying to understand what is happening (Schank & Abelson, 1977). On the other hand, there are always inherent differences between the goals of actor and observer, and what is relevant to either is still unknown. Overtly pointing out a normally irrelevant action in a story may make a reader

wonder why it was included, thus changing its relevance.

The Confounding of Typicality, Specificity and Relevance

Without distinguishing between the dimensions of typicality, specificity and relevance, there is understandably some controversy in recent literature regarding what kinds of events or actions are remembered or forgotten after schema-directed perception (Hastie, 1981). On the one hand, a schema may act as a template for perception (Neisser, 1976). If an object or event cannot instantiate an argument in an activated schema, it may not be represented in the memory of that event. Consequently, it would not be remembered when that episodic memory is reactivated during retrieval (Mandler, 1978). On the other hand, since reading, comprehension or identification of information is faster and more automatic when it is typical of the activated schema, it may be suspected that this shallower level of processing may result in a poorer memory for expected information (Bobrow & Norman, 1975; Craik & Lockhart, 1975; Lockhart, Craik & Jacoby, 1976). In this view, an unexpected or atypical object or action would receive more and deeper processing, and should therefore be remembered better than the expected and typical events. There appears to be, at first glance, research supporting both perspectives, but if one re-examines the text processing literature keeping in mind the confounding of specificity, typicality and relevance in many of the studies, much of the controversy can be resolved.

In testing for recall of the War of the Ghosts story used by Bartlett (1932), Mandler and Johnson (1977) found that relevant "basic nodes" of the story, such as its setting, were better recalled than were irrelevant elaborations of these nodes. For example, the main idea that the two men were going down to the river to hunt was better remembered than the elaborative description of the river being calm and foggy. However, this is a comparison across specificity levels as well as relevance; the generic setting information (river) was remembered better than

the specific details of the setting (calm and foggy), just as a sofa is recalled better than its figurative details (Mandler, 1978). Indeed, Mandler reports that nodes which can be optionally deleted from the story were recalled less often than the nodes necessary for the story structure, although these comparisons were never made as to the specificity of the instantiations of the basic nodes. To compare relevant versus irrelevant information, it would be necessary to test for recall at the same level of specificity; for example, "the river was calm and foggy" versus "going down the river to hunt fur seals."

Lichtenstein and Brewer (1978) tested subjects on memory for written and filmed actions such as writing a letter. Goal-directed actions, such as opening a drawer to take out a pen, were better recalled than non-goal events, such as closing the drawer after the pen was removed. Similarily, Anderson and Pichert (1978) found that, in reading a description of a house, subjects taking the role of a prospective buyer remembered items like "a leaky roof" whereas subjects taking a burglar's perspective remembered "a rare coin collection." Thus, recall of a descriptive text is dependent upon the relevance of the items to the subjects' purpose, in much the same way that recall is affected by the relevance to a character's goal that is inherent in the text.

In studies varying relevance of written information, relevant actions or events are remembered better than irrelevant ones (Anderson & Pichert, 1978; Black & Bower, 1979; Brown & Smiley, 1977; Christie & Schumacher, 1975; Kintsch & Keenan, 1973; Schallert, 1976). Bower et al. (1979) found that script "interruptions" such as the waitress spilling soup on a customer were recalled better than relevant script activities like reading the menu. Furthermore, irrelevancies such as the waitress' red hair were recalled worst of all unless they were highly unusual. This latter category, containing items like "the waitress was stark naked," was termed "vivid irrelevancies" and predicted to be recalled better than non-vivid

irrelevant information. It can be seen that, at least in their examples, Bower et al., (1979) may also be guilty of the common oversight of making comparisons between scripted activities across levels of specificity and typicality and calling it a comparison of levels of relevance. "Spilling soup on a customer" may be a more specific action than "reading the menu." Furthermore, it may be easier to explain the differences in memorability in Bower et al's irrelevant category with "typicality," rather than the "vividness" criterion; a naked waitress is far more atypical than is a waitress with red hair.

Another series of studies by Graesser and his collegues (Graesser, 1978; Graesser, Gordon & Sawyer, 1979; Graesser, Woll, Kowalski & Smith, 1980; Graesser, 1981) adds much more information and no small amount of confusion to this area. They predicted that typical information will be quickly lost over time and replaced by the generic script; atypical and irrelevant information will be specially tagged and will be recalled or recognized relatively better. To this end, texts were developed of everyday actions performed by a main character named Jack. Graesser uses the term "scripts" for both these stories and the schemas used in processing them. I will differentiate the two in the same way that Schank and Abelson and Bower et al. do; "script" refers to the schema and "text" to the written story. Each action had been rated according to typicality by an earlier group of subjects. Other subjects were then presented with the texts, and later tested for memory for these actions. After a half hour retention period, both recall and recognition were better for what Graesser defined as atypical and irrelevant actions than for typical actions. Furthermore, for recognition, there was no discrimination between presented typical actions and typical distractors. Graesser's use of discrimination scores stems from his observation that there are usually high levels of intrusions and false recognitions of typical events. To compare memory for typical versus atypical events, it is not sufficient to take only hit rates into

account. It is necessary to account for intrusions with a d' measure, thus removing the effect of schema-directed guessing upon the assessment of memory (Graesser et al., 1979, 1980).

On the surface, Graesser's results seem to support his predictions, but a closer look at the stimuli used shows that this is not so. On the basis of other studies, it would be predicted that Graesser's atypical actions would be recalled better than the typicals, and this is what is reported. But examples of what actions are found to be better remembered from the restaurant script are statements like "Jack straightened his tie," "bought some mints," "put away his tennis racket," and "cleaned his glasses." These are not statements one would necessarily expect to find in reading an account of going to a restaurant, but on the other hand, they could hardly be called "unexpected" either. As other researchers use the term, "atypical" has connotations of being surprising or out of place (Schank & Abelson, 1977; Bower et al, 1979; Friedman, 1979; Goodman, 1980; Brewer & Treyens, 1981). In further contradiction to the findings of other researchers, the highly remembered actions from Graesser et al. (1979) are certainly not relevant to the global action taking place; in most cases, they add nothing to the reader's understanding of what it means to go to a restaurant. Graesser interprets these counter-intuitive results as supporting his predictions, but there are several alternative explanations as to why these conflicting results occur.

First, Graesser et al's studies are comparing actions that vary in specificity. A statement like "picked a napkin off the floor" seems more specific than "the waitress brought the order," which is closer to a generic script argument. To make a fair comparison across levels of typicality, memory for the former statement would have to be compared to memory for "the waitress brought the chicken cordon bleu." If specificity is a determinant of memory, the confounding of these variables could account for Graesser's results. It is, of course, probable that

"picking something off the floor" in its general form is still less typical than the general "waitress" statement and may be remembered better, but the point remains that the specificity confound must be removed before it can be concluded that atypical statements are better remembered than typical statements.

Second, because comparisons are made across specificity levels, typicality at a generic and specific level may have also been confounded. A statement like "the waitress brought the order" belongs in a restaurant script, although little can be said about its typicality as a specific instantiation of the waitress or the order. Statements of this sort have been compared to statements like "Jack straightened his tie," which is specific and understandable in a restaurant context, and statements like "he put away his tennis racket" which is specific, but probably not generically included in a restaurant script. In short, it has been shown that general-typical statements are poorly remembered relative to an undefined mixture of statements varying in relevance, typicality and specificity.

Third, it is questionable whether the statements termed "irrelevant" are really irrelevant to the reader. It is more likely that, although the statements are irrelevant to Jack's goals, they are all relevant to a reader of a story about Jack. Furthermore, it is possible that, in a story, statements that have been defined as relevant to a scripted activity form a background whereas what was defined as irrelevant becomes interesting foreground information. A patron in a restaurant seeing "a waitress going into the kitchen" would probably pay no attention to the action, but pointing it out in a story without explanation invites the reader to speculate on why it was included in the first place.

Fourth, it is also apparent in these studies that memory for unequal amounts of information are being compared. There is an average of 24 typical actions in each text, some texts having as many as 34. In the other categories, termed "atypical-related" and "atypical-unrelated", there are only five actions each.

Hastie and Kumar (1979) found that, in a comparison of memory for behaviors congruent and incongruent with stereotypes, the recall of incongruent items was affected by the number of items in the set. In short, the smaller the atypical set size in relation to the typical set size, the higher the probability of recalling an item from that set. Conversely, memory for congruent behaviors was not affected by the number of items in that set. Hastie and Kumar point out that, if all items are stored equally in a list, a small number of incongruent items would stand out, as in the "von Restorff" effect. They speculate that incongruent behaviors are more informative and therefore more interesting to the reader than the expected congruent items, and would be processed more deeply by being connected to more other information with associative links. On the other hand, if congruent items are grouped by an organizing schema while incongruent items are stored as a separate list, it would be expected that only memory for incongruent items would be a function of the number of items in their set. Indeed, Graesser's Script Pointer Plus Tag model (explained in the next section) employs this sort of storage arrangement, and therefore would predict the set size effect that Hastie and Kumar observed.

These alternative explanations may, singly or in interaction with each other, account for Graesser's results. A further problem with Graesser's research is that he has limited his studies of memory to a narrow range of actions. As suggested earlier, it is questionable whether the actions labelled "atypical" are any more than just irrelevant. There is certainly enough evidence that unexpected or surprising events are better remembered, in both animal subjects (Grant, 1981; Maki, 1979; Terry & Wagner, 1975; Wagner, Rudy & Whitlow, 1973) as well as humans (Friedman, 1979; Loftus & Mackworth, 1978). This is the perspective that Schank and Abelson took with their hypothesized "weird list" and "script obstacles," and is also what Graesser and his collegues would predict. Yet this has not been tested

within the narrow range of typicality used in Graesser's own studies.

It can therefore be concluded that several variables are being confounded in the major works on memorability of script processed information. It is possible, however, to reinterpret the categories of the stimuli as far as they are given, and come to a few general conclusions. First, relevant information is recognized better than irrelevant. Second, specific-atypical actions are recognized better than specific-typical actions. Third, an examination of the major studies shows it cannot be stated whether general typical or atypical events and actions will be recognized better; this dimension has not been investigated with the typicality of the specific levels of instantiations held constant. General-atypical events might be more poorly remembered than general-typical events if they do not fit any activated schemas, that is, they are simply not understood (Bransford & Johnson, 1972; Neisser, 1976). On the other hand, if they are understood and they interrupt the processing script, they tend to be better remembered (Schank & Abelson, 1977; Bower et al., 1979). And finally, it also cannot be stated whether general or specific information will be remembered better, as this variable has not been tested independently of relevance and typicality.

Schematic Memory Models

In the area of schematically processed memory, there appears to be a conceptual blurring between the schematic representation of the semantic knowledge used in processing an episode and the representation of the episodic memory itself. In stating that instantiations are "bound to" generic arguments, the impression is given that episodic information is stored along with the schema (Anderson & Pichert, 1978; Bobrow & Norman, 1975; Brewer & Treyens, 1981; Mandler, 1978; Minsky, 1975). Although other writers (Rumelhart & Ortony, 1977; Hastie, 1981) acknowledge a hierarchical structure for schemas, they do so without specifying the episodic memory structure, beyond suggesting that the schema acts as a template or

framework for storing episodes in memory. These writers tend to favor a perspective of differences in processing as being responsible for observed differences in memory for typical, atypical and irrelevant material. Others, however (Schank & Abelson, 1977; Bower, Black & Turner, 1979; Graesser et al, 1979), have detailed the structure of episodic memory and thus suggest structural differences in memory for various events and actions. These models are discussed below.

Bower, Black and Turner (1979) present and contrast Full Copy and Partial Copy models. In the former, a representation is created that is completely separate from the schema. Either specific instantiations from perception or default values are interpreted in terms of the abstract variables of the script and stored as an independent unit. However, when two similar texts were presented sequentially, for example, "John at the Doctor" and "Bill at the Dentist," subjects recalled things from one text that had actually been presented in the other. This should not occur if separate episodic representations were created for each text, assuming that only the correct episode is accessed or activated during recall without interaction with other episodic traces. Consequently, Bower et al. (1979) reject the Full Copy model in favour of the Partial Copy model. In this model, episodic perception leaves traces in two locations, both a specific episodic memory structure and tags on the generic schematic arguments used to process it along with a general activation of the whole script. If both of the similar texts had been read, each would be represented by its unique episodic trace, each would tag the generic arguments used in its processing, and each would activate the script. Over time, both the episodic structure and the tags on the terminals fade, but if the tags on the generic terminals have been doubly activated by both texts, the result is activation above a criterion, creating false positive recognitions.

The Partial Copy model, then, makes the distinction between generic script actions and specific script instantiations in its explanation of observed false alarms

from other episodes. A model that postulates a pointer or indicator to the whole processing script can account for false alarms to generic statements, as can the Full Copy Model, but the Partial Copy model can also take into account false alarms to specific statements from other instantiations. When an instantiation of an argument occurs in an episode, that argument used in its processing is tagged, and the instantiation is then stored in a transient episodic store. Consequently, if the statement "the nurse checked John's blood pressure and weight" was presented in the "Doctor" text, the generic argument of an assistant performing preliminary procedures on the patient will be tagged. If the subject also reads a "Dentist" text and is then tested for the unstated "the dental hygienist checked and X-rayed Jack's teeth," the subject could falsely recognize that statement due to the tag on the generic argument left over from the processing of the "Doctor" text and the default activation from the "Dentist" text.

The Partial Copy model can deal with differences in memory for general and specific text actions by postulating structural differences in memory; that is, a transient episodic memory for instantiations and a more permanent semantic store for the script-based general arguments. It might be predicted that, over a short term, memory for specific and general information will be equal, due to the episodic trace remaining for specific information along with the double activation of arguments used for processing general information. It is an empirical question whether memory would be better for general or specific information over a long term, i.e., would the episodic trace or the activation tags be more enduring? Bower et al. (1979) do not specifically address this problem. Another weak point with the Partial Copy Model is that the model does not deal with observed differences in the typical-atypical dimension at all. Bower et al. show that script interruptions, that is, general atypical actions, are recalled better than typical statements, but the specific typicality dimension within general typical actions is not

considered. Further, interruptions are not accounted for in terms of the structure of the episodic memory; it is necessary for them to revert to a depth of processing argument based on the "interest" level of the generically atypical statements. Predictions concerning the dimension of relevance are also very weak. On one hand, the same depth of processing argument is applied, predicting relevant actions are processed at a deeper level than irrelevant actions. On the other hand, a structural argument is also employed, stating that irrelevant actions are represented only in episodic memory and would therefore be quickly lost as no script arguments exist to be tagged during processing.

Schank and Abelson (1977) hypothesized that scripts are used for comprehension of descriptions of everyday events and activities. For recall of this information, they postulated that an episodic memory would contain a pointer to the script used in perception that would be reactivated during retrieval. The actual instantiations of the script terminals with typical information was predicted to be lost over time. In addition to the pointer, a "weird list" is stored, containing the information that is atypical of the processing script. Thus, the action of reading a menu in a restaurant would be quickly forgotten, although it could be inferred, but finding the manager of the restaurant to be an old schoolmate would be recalled for some time. It was these hypotheses that Graesser and his associates (Graesser et al., 1979; Graesser et al., 1980) elaborated upon to form the Script Pointer Plus Tag (SP+T) model. In this model, a specific memory representation is created for any activity perceived, containing a "pointer" to the generic script used in its creation as well as a list of other actions that are unrelated or inconsistent with the script that have been specially tagged. The Partial Copy model presented earlier postulates two separate representations; a complete representation of the episode as well as tags on the schema arguments used in its processing. Conversely, the SP+T model is a more unitary representation, although not of the episode as such.

It consists of just a pointer to the generic script as a whole and a collection of tagged specific irrelevant or inconsistent information. Consequently, there is no postulated representation of specific instantiations of arguments that are consistent with the generic script. For example, the generic "ordering a meal" is represented through the script pointer, and the irrelevant "giving his girlfriend a book" is represented as a tagged item. But the specific information of, for example, what was ordered, is not taken into account in this model. Further, although this model would predict general intrusions from the processing script, it cannot account for specific false alarms from other texts as can the Partial Copy model. The SP+T model therefore is incomplete.

To summarize, the models discussed above appear to be inadequate, although, in light of the distinctions drawn here between dimensions of the material to be remembered, it is also apparent that none has been adequately tested. If it can be demonstrated that differences in memory exist across the dimensions of typicality, relevance and specificity, it will be necessary to expand these models or develop new ones to account for the data. To this end, the continua of typicality, specificity and relevance were disentangled to examine the relative contributions of each to memory for text. Stimulus materials were designed and rated such that every action or event was ranked as either high or low on each continuum. The range of typicality was increased to include actions that are atypical in terms of being instantiations of arguments of the processing script. Only actions that were typical in their generic form as instantiations of the processing script were used, in order to control for this dimension and to allow for the processing of stimulus materials to take place within the presented contexts without interruption. Set sizes were equal across continua, such that any effects found were due to the type of material to be remembered rather than to their relative amounts.

METHOD

Generation of Items

Sixty-nine subjects were drawn from a pool of introductory psychology students participating as part of a course requirement. Twenty-three script titles were chosen, describing common, everyday activities such as going to a restaurant, taking a dog to the vet, cleaning an apartment, etc. (see Appendix 1). Subjects were required to list as many actions and events as they could think of that belonged to one of the four categories formed by the factorial combination of typicality and relevance. Each category had an example given beneath its heading.

Subjects were tested in groups of between 15 and 20 individuals. Each subject was required to generate lists for two randomly chosen scripts, and each script was completed by six different subjects. About ten of the generated lists were not used, due to an obvious misunderstanding of the instructions.

Normative ratings

From the 23 scripts, four were chosen based upon the number of actions and events that had been generated and the general agreement of their sequence amongst subjects. These activities were *Going with a date for dinner to a nice restaurant, Moving to a new apartment, Being the best man at a friend's wedding,* and *Flying to another city to begin a vacation.* Using the subject-generated statements as a guide, several judges made lists of 23 relevant and 23 irrelevant actions, all of a general nature, for each of the four selected activities. Therefore, there were 46 actions for each of the 4 activities, forming a prototypic story for each activity. Each of the 184 actions was then expanded to eight forms; two general, three typical-specific and three atypical-specific. For example, the action of ordering in the restaurant had the two general forms of "Jack ordered the meal" and "Jack ordered the food." The six specific forms each had different examples of what Jack ordered; typical instantiations were "steak," "roast beef," and "chicken,"

while atypical instantiations were "squid," "beef tongue," and "haggis." The general forms, therefore, were instantiations that closely matched the generic arguments one would assume to find in the appropriate script. The specific forms were instantiations that could be matched with the script's generic argument and could also be assessed for typicality against the range of values within the script's generic argument.

The statements were presented to subjects to be rated on their typicality. Subjects were instructed to rate each statement as to its typicality or probability of occurrence within the context of the activity's title. They were requested to do so on a 7-point scale, with 7 meaning very typical or almost always occurring, and 1 meaning a very unlikely or atypical occurrence. Each subject saw a randomly chosen single form of each action for 2 different activities, for a total of 92 statements. Each form was rated by ten different subjects for a total of 160 subjects. Data from non-English speaking subjects were discarded, which left from eight to ten ratings per form. A second and third set of subjects rated the same set of statements on the relevance and specificity scales, using the same procedure and the same number of subjects. For relevance, subjects were instructed to rate each sentence as to its necessity in fulfilling the goal inherent in the title. Specificity was to be rated according to the amount of information given in each sentence. The more specific the sentence, the higher it was to be rated on the 7-point scale. At this point, every statement had been empirically defined as relevant or irrelevant to the goals of an activity, whether it was presented in a general or specific form, whether the general forms were typical of the processing script, and whether each of its specific forms were typical or atypical as instantiations of the general arguments.

Experiment 1

It will be recalled that Graesser's studies (Graesser, 1978; Graesser et al., 1979; Graesser et al., 1980) seemed to compare generic relevant-typical actions with more specific irrelevant actions. The first goal was to determine whether there is a difference in memory for general versus specific statements when these statements are not confounded with relevance and typicality.

From the rated stimuli, a subset of 16 actions from each of the 4 activities was chosen, on the basis of those that had been rated as the most relevant and typical, and whose forms had been sufficiently differentiated as general or specific.

The stimuli subset consisted of two general forms and two specific-typical forms for each of the 16 statements in each of the 4 activities, or 256 statements, presented in Appendix E. The general sentences averaged 7.3 words per sentence, the specific sentences averaged 8.9 words per sentence. Mean ratings on the 7 point scale for each condition are shown in Table I. Differences were found in both typicality, $t(128) = 4.95$, $p < .001$, and relevance ratings, $t(128) = 3.25$, $p < .01$ between the general and specific conditions. This was unavoidable when using generically similar statements; for example, one always orders "food" in a restaurant, but "steak" or any other specific dish is ordered less frequently, regardless of how typical the dish may be. What is ordered is also less relevant than the fact that food was ordered. Both conditions were, however, rated on the high end of the typical and relevant scales, but on opposite ends of the specificity scale. The stimulus sentence dimensions were all significantly correlated. The correlations were: typicality with relevance, $r(df = 256) = .30$, $p < .001$; typicality with specificity, $r(df = 256) = -.36$, $p < .001$; and relevance with specificity, $r(df = 256) = -.19$, $p < .001$. It was necessary to statistically correct for these correlations in order to isolate the effects of specificity on recognition memory.

For each of the four general activities, a prototype text was developed, consisting of a story about "Jack" carrying out the actitivies in their normal sequences. The actions within each prototype were randomly and independently assigned to the conditions listed below. One subject saw all four texts, which included eight general and eight specific actions. Each text had the general statements presented in the following manner. In each version, two statements were presented in their general form to be tested as general target statements; for example, "Jack ordered the meal" was seen at both acquisition and testing. Two additional presented general statements were tested with distractors of a different general form of the same action; for example, "Jack paid the bill" was seen at acquisition, and "Jack paid the tab" was seen at testing. Two presented general statements were tested with distractors of a specific form of the same action; for example, "Jack was shown to his table" was seen at acquisition, and "Jack was shown to his corner table" was seen at test. Two general unpresented statements acted as new general distractors at test. For the same subject, the eight specific statements were assigned to presentation conditions the same way. Two of the eight statements were presented to be tested with two specific target statements; for example, "Jack phoned to make 7:30 reservations" was seen at both acquisition and testing. Two presented specific statements were tested with specific distractors of the same action; for example, the presented statement "Jack ordered apple pie" was tested as "Jack ordered chocolate cake." Two presented specific statements were tested with general distractors of the same action; for example, "Jack left at 15% tip" was seen at acquisition, and "Jack left a tip" was seen at testing. Two more specific statements were unpresented at acquisition and used as specific distractors.

Three other randomly chosen subjects saw different versions of the texts, in which the eight general statements were "rotated" through the acquisition-test sequence for general statements as described previously, while the eight specific

statements were rotated through the specific acquisition-test sequence. Then, for four new subjects, the general statements seen by the first four subjects were presented in their specific forms throughout the specific acquisition-test sequence, while the specific statements seen by the first four subjects were presented in their general forms and sequence. Therefore, eight subjects saw the complete set of 16 statements counterbalanced in each of their four forms, in each of the eight acquisition-test conditions.

Each text had a title and 4 untested buffer statements at the beginning and end to minimize serial position effects and to give general orientations for each text. Presentation order of the texts was counterbalanced using a Latin Square such that, across four subjects, each text occurred in each serial position exactly once, and was both preceded and followed by every other text exactly once. Therefore, the complete design of eight versions in four sequences required 32 subjects.

Procedure

The four texts were presented to subjects using a VT100 terminal under programmed control of a DEC MINC-11 computer. Subjects sat at a table with the terminal screen approximately 40 cm in front of them. The subject had a touch pad consisting of a flat block of wood on which were mounted two strips of metal, such that the palm of the hand of their choice rested on one strip and the index finger could reach the other. Touching the finger to the second strip completed a circuit to signal a response. Subjects were allowed to position themselves and the pads for individual comfort and were allowed to use either hand. Sentences were presented on the terminal one at a time under subjects' control, to enable measurement of reading time. To control for sentence length, the dependent measure was reading time per word. The experimenter sat directly behind the subject at a second terminal.

Subjects were informed that the experiment was a study in the use of computers in education. The purpose was said to have been a comparison of traditional methods versus computer terminals in reading speeds and mathematics working speeds. Each subject was told that, by random chance, he or she would be reading passages on the terminal and doing math problems on sheets of paper.

Following acquisition, there was a 30 minute intervening task consisting of a series of math problems, after which the true nature of the study was explained, and memory for the texts was tested. In the recognition test, subjects were presented with target statements and distractors, and were asked to respond "old" or "new" to each statement using the two response pads. Presentation was under experimenter control; subjects heard a warning beep, and 500 msec later, the statement appeared on the screen. Following the test procedure, subjects were debriefed and allowed to leave. In sum, acquisition consisted of four scripts of twelve sentences each, plus four buffers, for a total of 64 sentences; recognition consisted of the same four scripts with the four unpresented distractors included, for a total of 80 sentences. The tasks took about one hour to complete.

Results

With the above procedure, it was possible to measure reading time and memory for general and specific statements that had been "primed" with (seen at acquisition as) either the same statement, a generically similar general statement, a generically similar specific statement, or no generically similar statement at all.

The first analysis was reading time for general versus specific information to discover if specific instantiations were read at different rates that statements matching general schematic nodes. Following were the analyses for memory of general versus specific statements. The first analysis was percent correct responses to discover if subjects were better at identifying whether or not a general or specific statement was presented previously. An analysis for percent "yes" responses

was carried out to examine differences in false alarms and hits as influenced by the processing schemas. A d' analysis was carried out to examine discrimination memory between general and specific items, with schema influenced guessing controlled for. Due to the correlations between ratings on the three rated dimensions, a multiple regression analysis was carried out to isolate the effects of specificity upon memory. And finally, an analysis of reaction times of responses was conducted to discover if there were any differences in response times to general versus specific statements.

The reading times per word are shown in Table II. Specific statements were read faster than general statements, $F(1,31) = 25.02$, $p < .001$. However, an analysis with activity as the random variable failed to show the effect, $F(1,3) = 3.98$, $p > .10$. As there were very few degrees of freedom in the latter test, the reading time data should be interpreted cautiously.

As noted above, previous tests of the SP+T model have confounded relevance, specificity and typicality. The present design allows a more critical evaluation of the model in terms of the dimension of specificity, while holding typicality and relevance high and relatively constant. Since the SP+T model postulates only a pointer to the generic script to encode all typical information, there should be no memory for relevant specific information. In other words, the only access a subject has to relevant, typical episodic information is the generic script, with no indication of which statements were or were not presented, and no specific instantiations of their arguments. Therefore, since all presented actions are typical and relevant, there should be no distinction seen at test among the targets and distractors; all conditions should yield high and equal hits and false alarms.

Any differences obtained in memory for general versus specific information will also necessitate elaborations of the Partial Copy Model. Bower et al. (1979) make no predictions as to whether the episodic trace of specific information or the

double activation tags of general information is the more enduring form of memory. They suggest that memory for generic actions remains after the specific information is lost, resulting in better memory for general statements. But this prediction is made without considering false alarms to unpresented general material will be higher than false alarms to unpresented specific statements. The present design will be able to answer these questions, as well as isolate the influences of the various distractors upon false alarms.

Percent correct responses (see Table III) were analyzed with a 4 X 2 repeated measures analysis of variance that crossed the four priming types at acquisition: identical, general, specific, and none, with general and specific forms at test. Specific test statements (82.1%) were correctly identified as old or new better than general test statements (64.5%), $F(1,31) = 124.35$, $p < .001$, regardless of type of acquisition sentence. A main effect was also found for priming type, $F(3,93) = 22.83$, $p < .001$, with only the unpresented condition (87.3%) correctly identified better than all other conditions, which did not differ from each other (identical = 70.3%, specific = 69.1%, general = 66.4%). The interaction of test form by acquisition form was also significant, $F(3,93) = 13.44$, $p < .001$. Newman-Keuls tests showed that, whereas all specific distractor statements were correctly identified as new better than the general distractor statements, the specific target statements (72.3%) were not recognized more accurately than general target statements (68.4%).

The data for the percent "yes" responses are shown in Table IV. Analysis of variance was performed on these data, using a 4 X 2 repeated measures design identical to the percent correct analysis above. Subjects responded affirmatively to general statements (44.7%) more often than specific statements (29.0%), $F(1,31) = 54.47$, $p < .001$. A main effect for priming was also found, $F(3,93) = 131.49$, $p < .001$. Newman-Keuls tests showed that subjects responded "yes" more to

targets (70.3%) than to either the general (33.6%) or specific (30.9%) distractor statements, which did not differ from each other. Subjects made fewest "yes" responses to the new statements, that is, statements which had not been primed at acquisition (12.7%).

The interaction of priming X test was also significant, $F(3,93) = 21.51$, $p < .001$. Newman-Keuls tests showed above that, although there was no difference in percent "yes" responses to general or specific targets, the false alarm rate was higher to the general statements than it was to the specific statements for each of the three distractor types. In addition, for general test statements, the percentage of "yes" responses differed reliably between the targets and all three distractors (general targets (68.4%) > general distractors primed with general statements (53.5%) > general distractors primed with specific statements (38.7%) > unprimed general distractors (18.4%)). For specific statements, responses also differed reliably between targets and each distractor, with the exception of general versus unpresented prime types (specific targets (72.3%) > specific distractors primed with specific statements (23.1%) > specific distractors primed with general statements (13.7%) = unpresented specific statements (7.0%)).

False alarms to new general statements (18.4%) show the extent of default processing. False alarms to new specific statements (7.0%) are lower, perhaps because their processing depends on both the schema and episodic instantiation. Subjects will readily false alarm to paraphrases of general statements (53.5%), but a working memory still persists to enable them to differentiate these distractors from general targets (68.4%). General distractors are also different from the unpresented distractors (18.4%). It may be that a longer intervening task would result in no discrimination between targets and general distractors, and possibly no discrimination between targets and unpresented distractors as the SP+T model predicts. Graesser et al. (1979) obtained insignificant discrimination after a 20 minute intervening task

in his second experiment, and consequently concludes working memory fades rapidly. The difference between these results and Graesser's might be seen in the media of presentation. Whereas this study presented both acquisition and test phases visually and under subject control, Graesser et al. tested after presenting the acquisition phase aurally at the rate of 200 words per minute. Obviously, Graesser's results cannot be generalized beyond his method of presentation as he later claims (Graesser et al. 1981).

When a subject sees a specific statement at acquisition and is tested with a general statement, false alarms are relatively high (38.7%). In contrast, a specific distractor following a general statement (13.7%) is much lower, as the specific instantiation is new information.

The d' analysis is shown in Table V. For this table, the distractor conditions were as follows: "none" means that both general or specific distractors were unprimed; "different" includes both specific distractors primed with general statements and general distractors primed with specific sentences; and "same" means both specific distractors primed with specific statements and general distractors primed with general statements. The d' scores were calculated for false alarms to each of the distractor conditions for both general and specific test conditions. Analysis of variance was performed on these data with a 3 X 2 repeated measures design; 3 levels of priming (none, different, same) crossed with 2 levels of test (general, specific). A main effect of test was obtained, $F(1,31) = 93.60$, $p < .001$, with specific statements discriminated better than general (2.06 vs 1.12). A main effect of priming was also found, $F(2,62) = 43.17$, $p < .001$, with unpresented statements discriminated the best (2.17) and the distractors of the same level of specificity as the test statement discriminated the worst (1.08). Newman-Keuls tests show all means are different between general and specific test statements at each of the 3 priming levels. Also, all means are different between levels of priming for

each level of test with the exception of specific-same versus specific-different distractors.

It would have been desirable at this point to carry out a d' analysis with activities as a random variable to discover the generalizability of these results across different scripts. This was infeasible because, as there were only two responses per distractor type in each activity for each subject, there were a number of cells with missing data. Therefore, the initial data were immediately collapsed across the four activities, such that the data could be analyzed with a ratio of correct responses out of eight for each cell per subject.

As mentioned earlier, specific statements tended to be less typical and relevant than general statements; therefore, a multiple regression analysis was conducted to isolate the effects of sentence specificity upon recognition memory. The three rated dimensions were the independent variables in the regression and percent correct was the dependent variable. Rating dimensions were entered into the equation in the order of relevance, typicality and specificity. Partialling out the first two left a partial correlation of $r(df = 124) = .46$, $p < .001$, between specificity and percent correct responses. Specificity was a reliable predictor of recognition memory.

The same procedure was carried out with the regression of percent "yes" responses to the unpresented distractors (unprimed general distractors and unprimed specific distractors) and different distractors (general distractors primed with specific statements and specific distractors primed with general statements). Specificity yielded a partial correlation of $r(df = 124) = -.29$, $p < .01$ with these false alarms. Specificity had an inverse relationship with the percent of false alarms.

The time that it took each subject to respond to each sentence was also obtained during the test phase. Correct reaction times were analyzed in a 4 X 2 repeated measure design (See Table VI), with the 4 conditions of acquisition

(identical, general, specific, none) crossed with the general and specific test conditions. General test statements were responded to faster than specific statements (2.46 seconds vs 2.58 seconds), $F(1,30) = 4.67$, $p < .001$. A main effect for priming was also obtained, $F(3,90) = 5.67$, $p < .001$; test sentences primed with general statements (2.74 sec) were not different from sentences primed with specific statements (2.56 sec), but showed a slower response time than sentences primed with the identical statement (2.43 sec) and those not primed (2.35 sec), which did not differ. No interaction was obtained, $F(3,90) = 0.76$, $p > .05$.

Discussion

These data show that differences exist in memory for general and specific information; consequently, the differences found by Graesser between what he called "typical" and "atypical" statements may be partly due to the varying specificity of his stimuli. The SP+T model predicts zero discrimination for all typical information, but the large differences obtained in this study between discrimination of specific and general information that is all relatively typical and relevant shows this prediction is in error. Contrary to the model, specific instantiations of typical actions seem to be stored or processed differently than general information.

The Partial Copy Model states that tags are placed on the generic argument used to process the instantiation, for example, "Jack left a tip," as well as storing the specific information in an episodic trace, for example, "Jack left a 15% tip." If the trace does not fade quickly and is still available to the subject, the model predicts large differences in memory between old and new specific relevant statements, and few false alarms when a new statement is primed with either a general form or another specific form. If the episodic trace fades and is no longer available, then false alarms to distractors are expected to be high, and discrimination between presented and nonpresented specific statements would be no better than that for general statements. The data are somewhere between these

extremes, showing good discrimination between presented and nonpresented specific statements as well as some false alarms for specific priming statements. The model might explain these results by postulating a "partially decayed" trace. Further, it may explain differences between false alarms to specifics that had been primed with general statements and false alarms to specifics that had been primed with other specific statements; both leave tags on the generic argument while only the alternate specific prime leaves an episodic trace.

The Partial Copy Model may, however, have trouble explaining the situation in which a specific statement during acquisition is tested against its general form. During acquisition, the generic argument is tagged, which would result in some false alarms at test. But an episodic trace is also created, which should attenuate false alarms. The data, however, show false alarms to be 38.7% in this condition. It cannot be argued that subjects only check the test statement against the tagged generic argument and make the decision at that point, for if this were the case, false alarms for specific-specific distractors would also be just as high. Yet it is apparent that specific information is still available to the subjects, as false alarms to general distractors (13.7%) are still lower than false alarms to specific distractors (23.0%; $p < .05$). The SP+T model, on the other hand, can account for none of the differences between specific and general memory.

As indicated earlier, reading time was marginally faster for specific than general statements; consequently a differential rehearsal interpretation is not a probable explanation for the obtained results of better memory for specific information. Therefore, a schematic representation would fit the data better.

Experiment 2

The second goal was to determine whether the differences obtained in Graesser's series of studies could also be due, in part, to differences in relevance and typicality of actions and events, as well as specificity. The second study

examined the combined effects of typicality and relevance upon reading time and memory for script-processed text. Four categories of high specificity statements were compared, such that the two dimensions of relevance and typicality were crossed. Again, generic typicality of the script actions was held constant, and all actions and events were specific instantiations of script arguments. The stimulus sentences, however, could be considered instantiations of relevant-typical, relevant-atypical, irrelevant-typical, and irrelevant-atypical arguments.

The SP+T model (Graesser et al. 1979, 1980) makes no allowances for memory for specific typical instantiations; therefore, the model predicts high and equal hits and false alarms for the relevant-typical items. If significant discrimination memory is found in this study as is expected, it will provide converging evidence as to the inadequacies of the SP+T model. This model also predicts good discrimination between presented and non-presented statements for the other three categories of statements; further, as atypical and irrelevant information is predicted to be equally tagged by this model, discrimination memory for each of relevant-atypical, irrelevant-typical and irrelevant-atypical statements should be roughly equal.

In testing the Partial Copy Model, Bower et al. (1979) used neither irrelevant nor atypical information; however, they made some predictions. The model assumes that what they call irrelevant information is stored only in working memory as there are no schematic arguments available to process it. Consequently, irrelevant information is forgotten once the working trace is gone. For the present study, the Partial Copy Model would predict low hit rates and poor discrimination memory for both irrelevant-typical and irrelevant-atypical information.

As stated above, Bower et al. (1979) showed that script deviations such as obstacles, errors and distractions (Schank & Abelson, 1977) are remembered better than information typical of the script. In the present study, both the typical- and

atypical-specific information is typical in its generic form; that it, the atypical statements are not deviations from the script, nor are they interruptions. The Partial Copy Model, therefore, would predict equal hits and false alarms for relevant-typical and relevant-atypical information, as there are no allowances made for different processes occurring for different types of information within the episodic trace.

In conclusion, if this study finds that irrelevant information, either typical or atypical, is retained over a period of time longer than a half hour, it may be interpreted as evidence against the Partial Copy Model. Further, if atypical information is found to be remembered better than typical as is expected, it will be necessary to account for these differences by either changing the structure of the model or by allowing that different levels of processing are used for information varying in typicality.

Procedure

From the set of all rated stimuli, a subset of 24 actions from each of the four activities was chosen; 12 relevant and 12 irrelevant actions from each. The most typical and atypical instantiations of each action were chosen; therefore, there was a total of twelve statements in each relevance X typicality condition for each of the four activities. Mean ratings for each cell on the three dimensions of typicality, relevance and specificity are presented in Table VII. The average number of words per sentence in each condition were as follows: relevant-typical, 8.8; relevant-atypical, 9.0; irrelevant-typical, 9.0; and irrelevant-atypical, 9.5.

Each text was constructed in four versions in order to counterbalance presented and non-presented statements, as well as typical and atypical instantiations of the same general action. For each text, three statements were randomly placed in each of the four cells. For a given subject, the acquisition phase consisted of four texts, each with three statements in each of relevant-typical, relevant-atypical,

irrelevant-typical, and irrelevant-atypical categories; plus four buffers per text as in Experiment 1. The test phase consisted of the four texts, each with six statements in each category, the three seen at acquisition plus three new distractors. A second subject saw the same number of statements with presented and distractor statements reversed. Subjects three and four saw the same actions as subjects one and two, with typical and atypical instantiations reversed. The four texts followed the counterbalanced order of presentation procedure in Experiment 1. The entire design required 16 subjects repeated twice, and the texts were presented in the same fashion as in Experiment 1.

Results

A sequence of analyses similar to Experiment 1 was carried out in order to examine the effects of the manipulation of the typicality and relevance dimensions upon memory. First, a reading time analysis was carried out to determine if differences in these dimensions affected reading times. A percent "yes" analysis was conducted to discover memory for this information in terms of hits and false alarm rates. A d' analysis showed discrimination memory with guessing corrected for, carried out with both subjects and activities as the random variable. Regression analysis isolated the effects of typicality and relevance upon memory, necessary because of the correlations between the ratings of the stimulus material. A reaction time analysis was also carried out to discover if information differing in typicality and relevance ratings were responded to at different speeds.

An analysis of variance was performed on reading time data with a 2 X 2 X 4 repeated measures design, with the two levels each of typicality and relevance crossed with the four activities. The means are presented in Table VIII. Atypical statements, as expected, took longer to read than typical statements, $F(1,31) = 10.67$, $p < .005$. There was no effect for relevance, $F(1,31) = 1.29$, $p > .05$, nor was there a typicality by relevance interaction, $F(1,31) = .08$, $p > .05$. The

same analysis with activity as the random variable also showed a small reading time effect for typicality, $F(1,3) = 5.86$, $p < .10$, but not for relevance, $F = .048$, $p > .10$.

Percent correct responses were analyzed with a 2 X 2 X 2 design: typicality by relevance by target/distractor. The means are presented in Table IX. The main effect for relevance, $F(1,31) = 7.98$, $p < .01$, shows irrelevant statements were recognized better than relevant statements (87.8% vs 84.8%). Also, atypical statements were recognized better than typical statements (89.2% vs 83.4%), $F(1,31) = 24.48$, $p < .001$. As in Experiment 1, distractors were recognized better than targets ($F = 50.40$, $p < .001$) across conditions, and each condition's distractor was recognized better than its respective target (Newman-Keuls, $p < .05$). Target-distractors did not interact with either relevance or typicality. Percent correct responses were analyzed with two two-way analyses, with typicality and relevance the variables for targets alone and for distractors alone. The means are presented in Table IX. For targets, an effect for typicality was obtained, $F(1,31) = 12.35$, $p < .001$, with no relevance effect or typicality-relevance interaction. For distractors, effects were obtained for typicality, $F(1,31) = 11.86$, $p < .005$, for relevance, $F(1,31) = 8.47$, $p < .01$, and the two way interaction, $F(1,31) = 12.55$, $p < .001$. Newman-Keuls tests on the distractors showed only the relevant typical correct rejections to be lower than the other three conditions, which were equal.

The percent "yes" responses for Experiment 2 were also analyzed with the 2 X 2 X 2 design, and the means are presented in Table X. Relevant-typical targets and distractors roughly replicated the results of Experiment 1, as this is the same type of information. For Experiments 1 and 2, relevant typical targets were responded to correctly at 72.3% and 74.2% respectively, distractors showed false alarms of 7.0% and 11.7%. Between experiments, there were large differences in the number of statements in these conditions. In Experiment 1, all 56 statements seen

at acquisition were relevant and typical, in Experiment 2, only 12 were. The storage of relevant information is presumed to be through the process of script instantiation, and therefore is affected little by the amount of information (Hastie & Kumar, 1979).

In the percent "yes" analysis, no main effects were found for either typicality or for relevance across targets and distractors, but the typicality by relevance interaction was significant, $F(1,31) = 5.30$, $p < .05$. There were no differences between "yes" responses to the targets in each of the four conditions. Newman-Keuls tests show more false alarms to unpresented relevant-typical distractors (11.7%) than to either of irrelevant-typical (5.0%), relevant-atypical (3.9%), or irrelevant-atypical distractors (4.2%), $p < .05$. This indicates the action of the schema; lower false alarms are found for information that is either atypical of, or irrelevant to, the processing schema. None of the other false alarm pairs are significantly different, but all three are below 5%, indicating a probable floor effect.

Newman-Keuls tests show more hits for atypical than for typical statements for both relevant (80.7% vs 74.2%: $p < .05$) and irrelevant information (84.1% vs 76.0%: $p < .05$). Irrelevant statements show no higher hit rates than relevant statements for either typical (76.0% vs 74.2%: $p > .05$) or atypical information (84.1% vs 80.7%: $p > .05$). However, the combination of irrelevant and atypical information shows the largest difference from relevant-typical statements (84.1% vs 74.2%: $p < .05$).

A d' analysis with subjects as the random variable (see Table XI) yielded main effects for typicality, $F(1,31) = 29.61$, $p < .01$, and relevance, $F(1,31) = 7.58$, $p < .01$. The interaction approaches significance ($F = 2.95$, $p < 0.10$). A second analysis with activity as the random variable also showed a typicality effect, $F(1,3) = 83.33$, $p < .005$, but no effect for either relevance, $F(1,3) = 2.73$, $p > .10$, or the typicality by relevance interaction, $F(1,3) = 1.57$, $p > .10$.

It is apparent that the obtained typicality effects would generalize to stories other than the four chosen for this study. In the first analysis, Newman-Keuls showed significance between all pairs of means ($p < .05$) except between the relevant-atypical and irrelevant-atypical conditions (relevant-typical (2.71) < irrelevant-typical (3.18) < relevant-atypical (3.53) = irrelevant-atypical (3.65)).

As there was a correlation between the relevance and typicality of the items and each correlated negatively with specificity, multiple regression analyses were conducted as in Experiment 1. The independent variables were the three rated dimensions, and the dependent variable was percent correct responses to each sentence. In the first analysis, rating dimensions were entered into the equation in the order of specificity, relevance and typicality. Partialling out specificity and relevance left a partial correlation between typicality and percent correct responses of $r(df = 170) = -.26$, $p < .01$. Typicality was a reliable predictor of recognition memory, $F(1,170) = 11.81$, $p < .001$, with atypical statements recognized better than typical. Partialling out specificity and typicality in the second analysis left a partial correlation of $r(df = 170) = -.09$, $p > .10$ between relevance and recognition memory. Recognition was not different between relevant and irrelevant information, $F(1,170) = 1.23$, $p > .25$.

Correct reaction times were analyzed in a 2 X 2 X 2 design, with typicality, relevance, and target/distractor as the factors. Means are presented in Table XII. Differences between relevant and irrelevant information approached significance, $F(1,31) = 3.98$, $p < 0.10$, with irrelevant statements responded to faster than relevant statements (2.27 seconds vs 2.36 seconds). No effect was found for either typicality or target-distractor. The relevance by typicality interaction was significant, $F(1,31) = 16.29$, $p < .001$. and Newman-Keuls tests showed the relevant-typical condition to be slower than all other conditions. The relevance by target-distractor interaction also was significant, $F(1,31) = 4.98$, $p < .005$, with only irrelevant

distractors showing a faster time than the other conditions. Neither the typicality by target-distractor interaction nor the 3-way interaction were significant.

Discussion

Memory for atypical information was better than for typical information, due to either more processing of the unusual instantiations or different storage of that information. Again, this is evidence against the Partial Copy Model that predicts equal processing and storage in an episodic trace of all information typical of the processing schema. These results supported the SP+T Model, but in this case the statements were truly atypical rather than the irrelevant, neutrally-typical statements of the sort used by Graesser and his associates (Graesser et al., 1979; Graesser et al., 1980). Also supporting the SP+T model and contrary to the Partial Copy model was the observation that irrelevant statements were recognized marginally better than relevant statements. Again, this may be due to actively pointing out irrelevant information in a text, such that the information is not so much irrelevant but is of unknown relevance to the subject. It could not be determined what the goals of the subjects were as they read the stimulus material, or even if the goals were similar across subjects. In either case, relevance and typicality have been demonstrated to be separate dimensions, having separate effects upon memory.

GENERAL DISCUSSION

It is evident that we are still a long way from achieving an adequate understanding of the schematic processing of text. Information perceived through reading is too complex to be defined exclusively along one continuum such as typicality or relevance. As mentioned earlier, typicality of what is included as a schema argument and typicality of an argument instantiation may well be separable, as may be the specificity of the processing schema in a hierarchical sense versus specificity of an instantiation. In addition, it is quite likely that other dimensions will be identified that will also have to be taken into account.

There are also problems with the approach taken in the paradigm of schematically-processed text. What is probably most apparent is that there are differences between schemas used to process texts of familiar situations and schemas used to process the perceptions of actually being in that situation. Primarily, what is relevant to a reader may be different than what is relevant to an actor; simply mentioning an irrelevant detail in a text may immediately change its relevance. It can also be conjectured that the process of argument instantiation is itself quite different between the two circumstances. In text, instantiations are given to the reader, specific details are brought to his or her attention in a manner very unlike the relatively haphazard fashion in which an actor samples the environment. Further, in text, it will always be necessary to take into account factors such as word frequency, the sequence of instantiation, and the emphasis inherent in sentence construction.

It is also apparent that, even though statements can be written that will be rated either high or low on each of the three tested continua, the dimensions will generally be interdependent. A general instantiation will generally be rated as more typical than a specific instantiation of the same argument, as the negative correlation

between typicality and specificity indicates. The same is true of the negative correlation between relevance and specificity; the more specific the details given in a sentence, the less relevant that sentence will become. On the other hand, the positive correlation between relevance and typicality may not be inherent in this kind of design. It may be possible, using schemas with few obligatory arguments, to construct a set of stimulus sentences that do not show this correlation, for example, "Everything Jack Did On His Three Week Vacation." But the resulting text would consist of such widely diverse actions that more than one schema would probably have to be used in its processing.

With the distinction between these three stimulus dimensions and their observed effects upon memory, it is apparent that the leading models of schematically processed episodic memory are insufficient and incomplete. Furthermore, it is doubtful if either can be expanded to include these considerations. The Script Pointer Plus Tag model would have to be, initially, a script for text-processing as opposed to a script for individual action in order to deal adequately with the changes in the relevance dimension. More importantly, memory for specific instantiations has to be taken into account in any model of text memory. Having instantiations "bound" to the processing arguments of a schema violates the semantic-episodic distinction, such that episodic traces would be considered to be stored in semantic memory. In addition, if each instantiation was bound directly to script arguments, it would result in endless numbers of connections from the many uses of the script, with no mechanism to differentiate which instantiations occurred together in a given episode. Having instantiations stored in a copy of the script in episodic memory removes the need for a script pointer in the first place. The Partial Copy model would also be difficult to modify. Although it does deal with script interruptions, it cannot handle the effects of typicality at the level of specific instantiations. Reverting to a levels of processing position for

memory for atypical and "vivid" irrelevant information defeats the goal of a structural model for schematic memory that Graesser and his associates and Bower et al. are trying to achieve. Consequently, new models will have to be developed.

Graesser and Nakamura (in press) have recently advanced a new model, the Schema Copy Plus Tag model, in which the pointer to the semantic schema is dropped altogether in favor of a complete copy of the schema into episodic memory. Also, in addition to the tagged "atypical" and "irrelevant" statements, all "moderately typical" statements are tagged and stored in a list form as well. This model can be criticized in much the same way as the Script Pointer Plus Tag model; there is no provision for specific instantiation of highly typical schematic arguments, the typicality dimension is still confounded with specificity, relevance and typicality are still equated, and, in testing the model, there were over four times the number of sentences in the typical condition as in the atypical or moderately typical conditions. The only part the schema plays in the episodic memory is the "Copy," consisting of only a few general statements of the highest typical, obligatory nature. Narrative text in the form of stories would have few general statements that match these nodes, while for an actor, all perceptions are specifically instantiated. For example, one never enters a restaurant and orders "food," so much as a specific dish. After reading a narrative text of all specific sentences, or experiencing a familiar situation as an actor, a perceiver would tag all the information equally and store it in an unorganized, undifferentiated list. This model is therefore practically the same as the Full Copy model, without the schematic organization.

In light of the failure of other models, and the identification of the stimulus dimensions above, it is necessary to propose a more encompassing model. The model being proposed here is still simple in that it assumes only three stimulus dimensions and a single schema operating at any given time. But it is more in

line with theories of schematic structure in semantic memory (Bower, Black & Turner, 1979; Goodman, 1980; Hastie, 1980; Mandler, 1980; Minsky, 1975; Rumelhart & Ortony, 1977). It may act as a heuristic to demonstrate how the observed data can be accounted for, and it emphasizes information that future models must consider. It will be referred to as the Copy Plus Instantiation model, or C & I model, of recognition memory.

Schemas in semantic memory are considered to be arranged in two dimensions (see Figure 1), such that the horizontal dimension is a time line, accounting for subjects' knowledge of the sequence of events, (Bower et. al., 1979; Rumelhart, 1980) whereas the vertical dimension is generic typicality. This model, therefore, provides both sequence and centrality or importance information for the general activities (Galambos & Rips, 1982). The top-most nodes are obligatory (Friedman, 1979; Minsky, 1975), consisting of such actions as entering, ordering, and receiving the bill in the restaurant script. .The distance of each node from the top of the diagram is based upon obtained typicality ratings for general statements, but could also be arranged by production frequency. This arrangement is not a hierarchy, in that lower nodes are not subordinate to higher ones. It is, however, recognized that each node is a hierarchy in itself (Bobrow & Norman, 1975; Friedman, 1975; Mandler, 1978; Minsky, 1975; Rumelhart & Ortony, 1977; Schank & Abelson, 1977). For example, the action of eating is superordinate to actions such as picking up the utensils, cutting the food and so forth.

Below the obligatory action nodes are optional arguments such as ordering a drink or dessert, decreasing in typicality. The higher the typicality of the node, the more its place tends to be fixed in the sequence, whereas low typical items can be more variable. Thus, in scripts with few obligatory arguments such as "Going to the beach," the argument sequence is less fixed. Within each node is a range of acceptable specific instantiations that independently range in typicality; for example,

the "ordering food" node may contain possible values from steak to squid. From the two typicality dimensions of arguments and their instantiations, it is possible to judge whether something is unusual or out of place (Minsky, 1975; Simon, 1975).

In this model, when a schema is activated through reading, it is copied, node by node, into episodic memory (see Figure 2). When a particular node is instantiated from the text, that instantiation is checked against the range of acceptable values in the schematic node, the node is copied to the episodic trace, and the specific instantiation is written within. The entire range of acceptable values is not assumed to be copied into episodic memory. An instantiation may be in general form such that it only matches the "name" of the node, or it may be in a specific form if there are more informative details present. As specific information is recognized better than general information, this model assumes that the more information gained from the text as an instantiation, the better the recognition memory. This may be a result of the representation being more elaborate (Craik & Jacoby, 1979; Van Dijk & Kintsch, 1983) and therefore better remembered. Consequently, more specific statements will be recognized better than less specific statements, which will be recognized better than general instantiations.

If a node is not instantiated by either a general or specific statement, the possibility of the node being copied is dependent upon its generic typicality rating. Highly typical nodes will be copied, resulting in false alarms to general typical statements (Graesser et. al., 1979, 1980, in press). In other words, the more typical the schematic node, the more likely the subject is to say "yes" during a recognition task, whether or not it was previously presented. If a node is instantiated with only a general statement, there is a tendency for the most likely value of the acceptable range to be copied in by default, resulting in false alarms to new specific statements if they are very typical (Mandler, 1978; Minsky, 1975). For nodes that are specifically instantiated, however, the more atypical the

instantiation, the better the memory. Typicality is determined by the placement of the instantiation within the range of acceptable values in much the same way as the nodes are themselves arranged within the semantic schema; the more atypical, the further from the "top" of the representation. Atypical instantiations will be lost at a slower rate than typical instantiations, resulting in better memory for specific atypical statements.

There are two separate dimensions of relevance considered in this model. The first is "centrality" or generic relevance, a dimension inherent within the script structure that defines the importance of each node in fulfilling the general goals for which the script is normally employed. For practical purposes, this dimension is synonymous with generic typicality; the higher the generic typicality of the node, the higher its importance in fulfilling the script's goals. The second dimension of relevance is a function of the purposes to which the schema is being applied. The present studies underscore the fact that what is relevant to an actor in a narration may not be relevant to a subject reading that narration. Therefore, predictions about memory for relevant versus irrelevant information is still speculative. Intuitively, however, it is reasonable to expect that subjects will better recognize information that is relevant to them. The model, therefore, assumes that the storage of each node would be modified according to the goals of the perceiver, so that relevant items would be weighted more than irrelevant items. As the script contains only generically relevant nodes, new nodes would have to be created in the episodic trace for information that is generically irrelevant, but relevant to the external, specific goals for which the script is being used. For example, a restaurant script could be used for going on a date or a business luncheon, where relevance of each node would vary widely between the two purposes. Whereas typicality and specificity are dependent upon and defined by the schema in its processing relationship to the text, specific relevance is external to it; the more

relevant the information to the goals of the perceiver, the heavier will its weight be, and the better the memory.

There may be other weighting factors aside from relevance. Further weighting may be functions of the individual interests and experiences of the perceiver, the concreteness or imagery called forth by the statement, word frequency, sentence structure, story structure, and possibly dozens of other factors that have yet to be considered. Other factors that this model does not take into account are the enabling relationships and causal chains between nodes, relationships that strongly influence perceptions of relevance and contribute to the recognition memory of statements. Still another is the effect of earlier instantations upon the range of acceptable values for later nodes; for example, choosing a seafood restaurant changes the typicality range for what is ordered later. Earlier instantiations may also change the sequence of the nodes; one typically orders coffee before reading the menu at breakfast, and after dessert at dinner. The nodes of this model are represented as independent units within the schema, while it is intuitively obvious that they are dynamically interdependent. The operations of these weighting factors will have to wait until such time as they can be identified and operationalized.

This model does not account for false alarms to statements from similar texts as obeserved by Bower, Black and Turner (1979). Graesser and Nakamura (in press) point out that these false alarms are data-driven retrieval operations as opposed to conceptually-driven recall intrusions. They conclude that false alarms of this sort are not a problem to a Full Copy model, since nodes from other episodic traces can be selectively activated by the activation in a similar episodic trace. An alternative explanation could be made by postulating that the "walls" of each episodic node are of a "porous" nature, such that specific instantiations may "leak out" rather than fading away within the node. Either fading or leaking out explanations would account for misses during later recognition tasks. The advantage

of the latter perspective is that, once an instantiation leaks out, it can be said to still exist in a "free-floating" state, such that it can be recaptured by its original parent node if the subject is reminded of it. Thus it could be missed during a recall task but remembered during a recognition task. In addition, a free-floating instantiation can be picked up by a node in a similar episodic trace that is identical generically to the instantiation's original node, resulting in cross-trace false alarms.

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APPENDIX A

Stimulus Generation Examples

1. Going out to a restaurant
   - RT: ordering food
   - RA: finding a fly in your soup
   - IT: couple at the next table is served fish
   - IA: man curses out loud when he spills his soup on himself
2. Attending your high school graduation
   - RT: listening to the Valdictorian's speech
   - RA: principle falls off the stage
   - IT: your best friend's parents congratulate him
   - IA: the shy, quiet girl from biology class is wearing the lowest cut dress you've ever seen
3. Getting ready for school in the morning
   - RT: washing your face
   - RA: breaking your shoelace
   - IT: roommate pours himself some cereal
   - IA: the smoke alarm goes off while you're frying bacon
4. Washing your car
   - RT: filling a bucket with water
   - RA: cutting your knuckle on the edge of a fender
   - IT: getting your feet wet
   - IA: you accidentally lock the cat in the car trunk
5. Painting a room
   - RT: covering the furniture with plastic sheets
   - RA: cat walks in the paint tray

IT: a little paint spatters on the newspapers covering the floor

IA: you discover your picture in a newspaper you're spreading on the floor

6. Washing clothes at a laundromat

RT: filling the washer with clothes

RA: machine steals your quarters

IT: middle-aged woman uses the machine next to yours

IA: teenager steals someone else's jeans from a dryer

7. Flying to another city by plane

RT: making reservations

RA: plane taxis to runway, then returns to terminal

IT: stewardess gives a pillow to a person in front of you

IA: passenger demands a window seat from the stewardess

8. Visiting the dentist

RT: getting your teeth X-rayed

RA: tooth shatters while it's being drilled

IT: nervous people are thumbing through magazines in the waiting room

IA: patient faints when called to go in

9. Building a bookcase

RT: buying boards

RA: board splits while it's being nailed

IT: roommate asks what time to begin cooking dinner

IA: pick up a hitchhiker on the way to the lumberyard

10. Going to a wedding

RT: going through the receiving line

RA: bride is late arriving at the church

IT: mother of the bride is in tears

IA: guest wears grubby jeans and T-shirt to church

11. Planting a garden

RT: rototilling the soil

RA: hose doesn't reach from the house to the garden plot

IT: you set out the lawn furniture for the summer

IA: you discover a swarm of wasps in the garage

12. Taking your dog to the vet

RT: carrying your dog to the car

RA: dog escapes from the waiting room

IT: other dogs are whining and barking

IA: someone brings in a boa constrictor

13. Going fishing

RT: baiting the hook

RA: box of lures spills into the water

IT: pour a cup of coffee from your thermos while fishing

IA: herd of moose is drinking at the edge of the lake

14. Going to a picnic on the beach

RT: spreading the blanket on the sand

RA: winning first prize in a sand castle contest

IT: clouds cover the sun momentarily

IA: RCMP tow a rusted car out of the lake

15. Attending a surprise birthday party

RT: hiding in the dark

RA: half the balloons have holes in them

IT: tell a friend about a movie you saw last night

IA: neighbor comes in to say her child is missing

16. Visiting a friend in hospital

RT: looking for the right room

RA: nurse mistakes you for a patient and insists you return to bed

IT: nurse wheels a patient by in a wheelchair

IA: someone dies and the doors are temporarily closed while the corpse is removed

17. Cleaning the house

RT: dusting the bookshelves

RA: Ming vase gets knocked off the bookcase

IT: listening to your stereo

IA: door-to-door salesman tries to sell you a set of very expensive encyclopedia

18. Going to the supermarket

RT: selecting a kilogram of apples

RA: buying lobster for a treat

IT: store clerk places price tags on cans

IA: woman behind you in line drops her eggs on the floor

19. Moving to a new apartment

RT: packing the china

RA: furniture doesn't all fit in the van

IT: neighbor returns your hedge clippers

IA: find a diamond ring under the sofa

20. Babysitting several children

RT: changing the baby's diapers

RA: baby begins to turn blue

IT: phone rings, wrong number

IA: fridge is full of cat and dog food

21. Attending a rock concert

RT: waiting for the main attraction

RA: star's plane is delayed, substitute local group is introduced

IT: everyone around you is screaming for more

IA: you don't see any policemen around

22. Shopping downtown

RT: trying on a shirt

RA: store detective asks you to empty your pockets

IT: mail a letter on your way downtown

IA: see a religious cult group dancing

23. Writing a term paper

RT: deciding on a topic

RA: a much needed article is cut out of its journal with a knife

IT: daydream about summer

IA: someone is singing in the library

APPENDIX B

TYPICALITY INSTRUCTIONS

This is an experiment about people's knowledge about about everyday activities. Imagine, for a moment, that you are planting a garden in your backyard. What sorts of things would you be doing? Well, you'd prepare the soil, buy some seeds, dig the rows, drop in seeds and cover them up. If I were to ask any one of you how you'd go about planting a garden, your answers would all be pretty much the same. If I were to ask you what sorts of things happen when you go to a dentist, or when you go to the beach for an afternoon, or when you go to supermarket, the same thing would happen. Most people would answer with many of the same things. This is because we all have similar experiences, we all know how these simple procedures are carried out, and we all know what sorts of things usually happen.

Now, let's say we were talking about planting a garden and someone mentioned preparing the soil. Suppose I asked you how "typical" that action is of someone planting a garden. You'd probably say it was very typical, because it's always done. How about digging the rows? Well, that's pretty typical, but sometimes seeds are dropped in little holes in clusters rather that along a row. So digging the rows is a little less typical than preparing the soil. How about setting out the lawn furniture? That's not typical of planting a garden, but it's certainly not what you'd call very atypical. Some gardeners might set out the lawn furniture since they're in the back yard anyway. How about digging up an antique bayonet? If you're talking about planting a garden, that's a very atypical action, it's possible, but very unlikely.

Now, say you were rating each of the actions I've just talked about on a 7 point scale. Seven means very typical and 1 means very atypical. You might give "preparing the soil" a 7, "digging rows" might get a 6, and taking out the lawn

furniture might get about a 3. And the action of digging up an antique might be rated as a 1.

This is exactly what I want you to do. In front of you are two booklets. On the first page of each is a title of a common, everyday activity. Following is a list of actions performed by a fictional character named Jack. Their sequence is all jumbled up but don't worry about that. I'd like you to rate each action from 1 to 7 as to how typical it is or how often it happens when one is carrying out the main action in the title. The more typical it is, the higher the number you'd give it.

APPENDIX C

RELEVANCE

This is an experiment about people's knowledge about everyday activities. Imagine, for a moment, that you are planting a garden in your backyard. What sorts of things would you be doing? Well, you'd prepare the soil, buy some seeds, dig some trenches, drop in the seeds and so forth. You would be doing each of these things because you have a goal or purpose in mind, to get the garden in. And because you probably know how to plant a garden, you could give me a list of all the actions that are relevant to this purpose, all the actions that are necessary to fulfill this goal. If I were to ask you what are the goals of building a bookcase, or visiting a friend in hospital, or washing your car, you'd be able to give me the goals for each. And you'd be able to give me a list of actions that would fulfill those goals.

Now, let's say we were talking about planting a garden and someone mentioned preparing the soil. Suppose I asked you how relevant that action is to the goal of planting a garden. You'd probably say it was very relevant, because it's necessary. You can't plant a garden unless you've prepared the soil. What if I asked you how relevant buying a hoe was? Well, it's quite relevant, but you might be able to borrow one. So that action is still relevant, but less relevant or necessary that preparing the soil. How about putting up a scarecrow? That's not exactly necessary, so it's a little less relevant to your goal, but it's certainly not what you might call an irrelevant action. How about putting out the lawn furniture for the summer? That's irrelevant because it doesn't have much to do with planting a garden. But the gardener has to take a break from gardening in order to do it, so it's still slightly relevant. How about seeing a taxi drive by? That's not relevant at all, in fact, it's irrelevant to what you're doing. Now, let's say you were rating each of these actions I was just talking about on a 7 point

scale. Seven means very relevant and one means very irrelevant. You might rate "preparing the soil" as a 7, 'buying a hoe" might get a 6, and putting up a scarecrow might be a 5 or 4. Taking out the lawn furniture might be a 3 or a 2, and seeing a taxi drive by might be a 1.

This is exactly what I want you to do. In front of you are two booklets. On the first page of each is a title of some common, everyday activity. First, think of the goal of that activity. Following is a list of actions performed by a fictional person named Jack. Their sequence is all jumbled up, but don't worry about that. I'd like you to rate each action from 1 to 7 as to how relevant or how necessary it is to the goal you've decided on from the title. The more relevant it is, the higher the number you'd give it.

APPENDIX D

SPECIFICITY INSTRUCTIONS

This is an experiment about the way information is structured in sentences. Imagine for a moment that you are reading sentences giving you information about planting a garden. . So you read sentences like preparing the soil, digging the rows, putting in the seeds and so forth.

Now, every action that you read about can be stated in several ways. For example, it could be stated in a very general form like "preparing the soil". Or, it could be more specific, like "rototilling the soil". Or it could be very specific, like "preparing the soil with a borrowed rototiller". Of course, you could get extremely specific by describing the type of motor the rototiller has, how much gas it uses, and so forth, but that is getting outside the purposes of this experiment.

Now, here's what I want you to do. In front of you are two booklets of statements about a fictional person named Jack carrying out some common, everyday activities. Their sequence is all jumbled up, but don't worry about that. The type of activity will be in the title at the top of the first page. The statements are about things that happen while Jack is carrying out these activities; some are important to his goals and some aren't, but that's not important.

What I would like you to do is to rate each statement as to whether each is written in a general or specific form, and how specific it is. And I'd like you to do it on a 7 point scale. A statement that is very general would be given a 1, and a statement that is very specific would be given a 7. For example, "putting in the seeds" might be a 1, "carefully spacing the seeds in the row" might be a 4, and "carefully spacing the seeds 2 inches apart in the row" might be a 6 or a 7. Statements that have nothing to do with planting a garden will be rated in the same manner, a 1 for a very general form, and a 7 for a very specific form.

APPENDIX E

Experiment 1. Stimulus Sentences

T=Target, B=Buffer, G=General, S=Specific

T. Going To A Restaurant.

B 1991Jack wanted to take Jane to a nice restaurant for dinner.

B 1992Jack asked Jane to go out with him and she said yes.

G 1011Jack decided which restaurant to go to.

G 1012Jack decided which restaurant to eat at.

S 1013Jack decided to go to a new restaurant.

S 1014Jack decided to go to a popular restaurant.

G 1021Jack phoned to make reservations.

G 1022Jack called to make reservations.

S 1023Jack phoned to make 7:00 pm reservations.

S 1024Jack phoned to make 6:30 pm reservations.

G 1031That evening, Jack got ready.

G 1032That evening, Jack prepared to go.

S 1033That evening, Jack washed up and got ready.

S 1034That evening, Jack showered and got ready.

G 1041Jack went to pick up Jane, his pretty girlfriend.

G 1042Jack went to pick up Jane, his attractive girlfriend.

S 1043Jack went to pick up Jane, his brownhaired girlfriend.

S 1044Jack went to pick up Jane, his redheaded girlfriend.

G 1051Jack and his girlfriend went to the restaurant.

G 1052Jack and his girlfriend made their way to the restaurant.

S 1053Jack and his girlfriend took his car to the restaurant.

S 1054Jack and his girlfriend took his Dad's car to the restaurant.

G 1061Jack and Jane entered the restaurant.

G 1062Jack and Jane went into the restaurant.

S 1063Jack and Jane entered the restaurant, through its carved wooden doors.

S 1064Jack and Jane entered the restaurant, through its wrought iron doors.

G 1071Jack and his girlfriend were shown to their table.

G 1072Jack and his girlfriend were seated at their table.

S 1073Jack and his girlfriend were shown to their table, which was near a corner.

S 1074Jack and his girlfriend were shown to their table, which was near a wall.

G 1081Jack ordered a drink.

G 1082Jack ordered a cocktail.

S 1083Jack ordered a rum and coke.

S 1084Jack ordered a rye and ginger.

G 1091Jack and Jane were given menus.

G 1092Jack and Jane were handed menus.

S 1093Jack and Jane were given menus, which were printed in booklets.

S 1094Jack and Jane were given menus, which were printed in folders.

G 1101Jack ordered his meal.

G 1102Jack ordered his food.

S 1103Jack ordered the steak.

S 1104Jack ordered the roast beef.

G 1111Soon the meal was served.

G 1112Soon the meal was brought.

S 1113Soon the well-prepared meal was served.

S 1114Soon the piping-hot meal was served.

G 1121During dinner, Jack and his girlfriend talked together.

G 1122During dinner, Jack and his girlfriend spoke together.

S 1123During dinner, Jack and his girlfriend talked about a new movie.

S 1124During dinner, Jack and his girlfriend talked about a recent concert.

G 1131Later, Jack ordered dessert.

G 1132Later, Jack asked for dessert.

S 1133Later, Jack ordered cheesecake for dessert.

S 1134Later, Jack ordered chocolate cake for dessert.

G 1141The bill for the evening was presented.

G 1142The tab for the evening was presented.

S 1143The expensive bill for the evening was presented.

S 1144The expected bill for the evening was presented.

G 1151Jack paid the check, using his charge card.

G 1152Jack paid the check, using his credit card.

S 1153Jack paid the check, using his Master Charge card.

S 1154Jack paid the check, using his American Express charge card.

G 1161Jack left a tip for the waitress.

G 1162Jack left a tip on the table.

S 1163Jack left an average tip for the waitress.

S 1164Jack left a small tip for the waitress.

B 1993Jack and his girlfriend left the restaurant.

B 1994Jack asked Jane if he could see her again soon.

T. Moving To A New Apartment.

B 2991Jack was going to move to a new apartment.

B 2992Jack's friend Bill came over to help him move.

G 2011Jack went to get the truck he had rented.

G 2012Jack went to get the moving van he had rented.

S 2013Jack went to get the one-ton truck he had rented.

S 2014Jack went to get the pick-up he had rented.

G 2021Jack found some cardboard boxes at a store.

G 2022Jack found some cardboard boxes at a shop.

S 2023Jack found some cardboard boxes at a drug store.

S 2024Jack found some cardboard boxes at a grocery store.

G 2031Jack dropped off a change of address card.

G 2032Jack dropped off an address change note.

S 2033Jack dropped off a change of address card at the post office.

S 2034Jack dropped off a change of address card at the university registrar's office.

G 2041Jack began to pack up the cookingware in the kitchen.

G 2042Jack began to pack up the kitchenware in the kitchen.

S 2043Jack began to pack up the glasses in the kitchen.

S 2044Jack began to pack up the silverware in the kitchen.

G 2051Jack went to his bedroom to pack his wardrobe.

G 2052Jack went to his bedroom to pack his clothes.

S 2053Jack went to his bedroom to pack his shirts.

S 2054Jack went to his bedroom to pack his sweaters.

G 2061Jack dismantled some of the furnishings before moving them.

G 2062Jack dismantled some of the furniture before moving it.

S 2063Jack dismantled the bookcase before moving it.

S 2064Jack dismantled the bed before moving it.

G 2071Jack carefully packed his framed pictures.

G 2072Jack carefully packed his framed prints.

S 2073Jack carefully packed his framed pictures of mountains.

S 2074Jack carefully packed his framed pictures of landscapes.

G 2081Then Jack packed his collection of books.

G 2082Then Jack packed his small library.

S 2083Then Jack packed his collection of novels.

S 2084Then Jack packed his collection of paperbacks.

G 2091The record collection was next to be packed.

G 2092The music collection was next to be packed.

S 2093The collection of rock music was next to be packed.

S 2094The collection of big band music was next to be packed.

G 2101Jack packed up his sports equipment.

G 2102Jack packed up his athletic equipment.

S 2103Jack packed up his hockey equipment.

S 2104Jack packed up his baseball equipment.

G 2111Jack and his friend loaded the truck.

G 2112Jack and his friend packed things into the truck.

S 2113Jack and his friend quickly loaded the truck.

S 2114Jack and his friend slowly loaded the truck.

G 2121Jack returned something he had borrowed from a neighbor.

G 2122Jack returned something his neighbor had lent him.

S 2123Jack returned a tennis racket he had borrowed from a neighbor.

S 2124Jack returned some dishes he had borrowed from a neighbor.

G 2131Jack found his new parking place.

G 2132Jack found his new parking spot.

S 2133Jack found his new parking place next to the apartment.

S 2134Jack found his new parking place behind the apartment.

G 2141Jack and the new landlord inspected the apartment.

G 2142Jack and the new landlord checked the apartment for damages.

S 2143Jack and the new landlord found a few wall scratches in the apartment.

S 2144Jack and the new landlord found a burnt out light bulb in the apartment.

G 2151They carried Jack's things into the apartment.

G 2152They carried Jack's things into the building.

S 2153They carried Jack's things up in the elevator.

S 2154They carried Jack's things in through the back way.

G 2161They unpacked and cleaned up the packing materials.

G 2162They unpacked and discarded the packing materials.

S 2163They unpacked and carried the boxes out to the garbage.

S 2164They unpacked and stacked the boxes in the hallway.

B 2993Jack returned the truck to the rental office late that evening.

B 2994Jack returned to his new home to settle in.

T. Going To A Wedding.

B 3991Jack's friend Sam was getting married.

B 3992Sam asked Jack to be his best man.

G 3011Jack received the wedding invitation in the mail.

G 3012Jack received the wedding announcement in the mail. .

S 3013Jack received the gilt-edged wedding invitation in the mail.

S 3014Jack received a printed wedding invitation in the mail.

G 3021Jack bought a wedding gift for the couple.

G 3022Jack bought a wedding present for the couple.

S 3023Jack bought a toaster as a present for the couple.

S 3024Jack bought a coffee maker as a present for the couple.

G 3031Jack went to pick up the groom where he was staying.

G 3032Jack went to pick up the groom where he was living.

S 3033Jack went to pick up the groom at his house.

S 3034Jack went to pick up the groom at his apartment.

G 3041They soon arrived at the church.

G 3042They soon arrived at the chapel.

S 3043They soon arrived at the Catholic church.

S 3044They soon arrived at the Lutheran church.

G 3051Jack parked and went in the church.

G 3052Jack left the car and went in the church.

S 3053Jack went in the church after parking in the parking lot.

S 3054Jack went in the church after parking in front.

G 3061Jack held the ring so he wouldn't lose it.

G 3062Jack carried the ring so he wouldn't lose it.

S 3063Jack carried the ring in his pants pocket so he wouldn't lose it.

S 3064Jack carried the ring in his jacket pocket so he wouldn't lose it.

G 3071Afterwards, they posed for photographs.

G 3072Afterwards, they posed to have their pictures taken.

S 3073Afterwards, they posed for photographs on the church lawn.

S 3074Afterwards, they posed for photographs in a local park.

G 3081Jack stood near the groom for several pictures.

G 3082Jack stayed by the groom for several pictures.

S 3083Jack stood off to the left of the groom for several pictures.

S 3084Jack stood off to the right of the groom for several pictures.

G 3091That evening, Jack went to the reception.

G 3092That evening, Jack went to the banquet.

S 3093That evening, Jack went to the hotel for the reception.

S 3094That evening, Jack went to the church hall for the reception.

G 3101Jack helped set up the music for dancing.

G 3102Jack helped set up the sound system for dancing.

S 3103Jack helped set up the dance band for dancing.

S 3104Jack helped set up the rock band for dancing.

G 3111Jack danced several dances with one of the wedding group.

G 3112Jack danced several dances with one of the wedding party.

S 3113Jack danced several dances with the bride.

S 3114Jack danced several dances with one of the bridesmaids.

G 3121Jack took a lot of pictures of the festivities.

G 3122Jack took a lot of pictures of the celebrations.

S 3123Jack took a lot of pictures of the dancing.

S 3124Jack took a lot of pictures of the guest speakers.

G 3131Jack sneaked out to the groom's car to play a trick on him.

G 3132Jack sneaked out to the groom's car to play a practical joke on him.

S 3133Jack sneaked out to the groom's car to tie tin cans to it.

S 3134Jack sneaked out to the groom's car to spray it with shaving cream.

G 3141Jack took a collection for the new couple.

G 3142Jack accepted donations for the new couple.

S 3143Jack took a collection in a cardboard box for the new couple.

S 3144Jack took a collection in a salad bowl for the new couple.

G 3151Jack received a small gift from the groom for helping out.

G 3152The groom gave Jack a small present for helping out.

S 3153Jack received a jewelled tie clip from the groom for helping out.

S 3154Jack received a gold chain from the groom for helping out.

G 3161Jack said farewell to the couple as they left.

G 3162Jack made his goodbyes to the couple as they left.

S 3163Jack threw confetti at the couple as they left.

S 3164Jack applauded the couple as they left.

B 3993Jack took some wedding cake as a souvenir of the wedding.

B 3994Late that evening, Jack drove his car home.

T. Going On A Trip With A Commercial Airline.

B 4991Jack had two weeks holiday coming up.

B 4992Jack decided to fly to another city for his holiday.

G 4011Jack got some information about his holiday destination.

G 4012Jack read some material about his holiday destination.

S 4013Jack got some information about the ski areas at his holiday destination.

S 4014Jack got some information about the national parks at his holiday destination.

G 4021Jack got his tickets.

G 4022Jack received his tickets.

S 4023Jack picked up his tickets himself.

S 4024Jack picked up his tickets from the agent.

G 4031Jack bought some supplies for his trip.

G 4032Jack bought some personal effects for his trip.

S 4033Jack bought a bathing suit for his trip.

S 4034Jack bought a pair of jogging shoes for his trip.

G 4041Jack packed his bags.

G 4042Jack packed his luggage.

S 4043Jack packed some things in a suitcase.

S 4044Jack packed some things in an overnight bag.

G 4051Jack put his name on his luggage.

G 4052Jack put some identification on his luggage.

S 4053Jack put his name on a sticker on his luggage.

S 4054Jack put a name tag on his luggage.

G 4061An airline employee announced it was time to board the plane.

G 4062Someone who worked for the airline announced it was time to board the plane.

S 4063A steward announced it was time to board the plane.

S 4064The desk clerk announced it was time to board the plane.

G 4071Jack walked through security.

G 4072Jack checked through security.

S 4073Jack walked through the metal detector passageway at security.

S 4074Jack was checked with a hand-held metal detector at security.

G 4081Jack got on the plane.

G 4082Jack boarded the plane.

S 4083Jack boarded the plane via the loading ramp.

S 4084Jack boarded the plane by following the passenger lineup.

G 4091Jack found his seat on board.

G 4092Jack found his seat on the plane.

S 4093Jack found his seat in the front on board.

S 4094Jack found his seat in first class on board.

G 4101Jack watched the stewardess demonstrate emergency procedures.

G 4102Jack watched the stewardess demonstrate what to do in case of an emergency.

S 4103Jack watched the stewardess demonstrate how to use the oxygen masks.

S 4104Jack watched the stewardess demonstrate evacuation procedures.

G 4111Jack felt a surge of emotion as the plane took off.

G 4112Jack had some strong feelings as the plane took off.

S 4113Jack felt a surge of excitement as the plane took off.

S 4114Jack felt a surge of anticipation as the plane took off.

G 4121The pilot made an announcement.

G 4122The pilot spoke over the PA system.

S 4123The pilot announced the weather over the PA system.

S 4124The pilot announced the time of arrival over the PA system.

G 4131Jack enjoyed the flight.

G 4132Jack enjoyed the trip.

S 4133Jack enjoyed the long flight.

S 4134Jack enjoyed the night flight.

G 4141The plane landed.

G 4142The plane touched down.

S 4143With a bump, the plane landed.

S 4144With a roar, the plane landed.

G 4151Jack left the plane.

G 4152Jack got off the plane.

S 4153Jack disembarked from the plane.

S 4154Jack walked off the plane.

G 4161Jack picked up his luggage.

G 4162Jack picked up his baggage.

S 4163Jack picked up his luggage from the conveyor belt.

S 4164Jack picked up his luggage from the carousel.

B 4993Jack left the airport by taxi.

B 4994Jack had a wonderful time on his holiday.

APPENDIX F

Experiment 1. Stimulus Ratings.

Matched by statement number with Appendix E.

Stno.	Typ		Rel		Spec	
	Mean	SD	Mean	SD	Mean	SD
1011	5.20	(1.55)	6.20	(0.79)	2.67	(1.58)
1012	5.50	(1.08)	5.80	(1.14)	3.11	(1.36)
1013	5.70	(0.67)	5.80	(1.03)	3.30	(1.34)
1014	6.10	(0.88)	5.60	(1.51)	3.00	(1.20)
1021	5.30	(1.25)	6.00	(1.41)	3.00	(1.51)
1022	6.50	(0.97)	7.00	(0.00)	3.50	(2.12)
1023	6.40	(0.70)	6.90	(0.32)	4.40	(1.43)
1024	6.00	(1.05)	6.20	(0.92)	5.60	(1.17)
1031	6.70	(0.67)	4.90	(2.23)	2.20	(0.92)
1032	6.20	(1.14)	5.10	(1.97)	2.00	(1.32)
1033	6.80	(0.63)	6.00	(0.94)	2.40	(1.07)
1034	6.50	(1.08)	5.80	(1.40)	2.80	(0.92)
1041	6.60	(0.70)	6.40	(1.07)	5.00	(1.49)
1042	5.90	(0.88)	6.10	(1.10)	4.60	(1.17)
1043	4.60	(2.12)	6.10	(1.52)	5.30	(1.34)
1044	5.00	(2.31)	5.90	(1.85)	5.10	(1.66)
1051	6.60	(0.70)	6.50	(0.71)	2.56	(1.67)
1052	6.10	(1.52)	6.10	(1.29)	2.20	(1.14)
1053	6.60	(0.70)	4.50	(1.72)	3.75	(1.39)
1054	4.80	(1.03)	4.50	(1.58)	4.44	(1.13)
1061	7.00	(0.00)	6.30	(0.82)	2.40	(1.43)

1062	7.00 (0.00)	6.20 (1.55)	2.25 (1.04)
1063	5.30 (0.95)	4.30 (2.11)	5.44 (1.33)
1064	4.20 (1.03)	4.50 (1.43)	6.10 (1.20)
1071	6.70 (0.48)	4.80 (1.87)	3.00 (1.41)
1072	6.80 (0.42)	6.20 (1.40)	3.80 (1.03)
1073	5.40 (1.07)	5.70 (0.95)	5.60 (1.07)
1074	5.80 (0.79)	5.00 (1.70)	4.50 (1.77)
1081	6.00 (1.70)	4.50 (1.58)	2.10 (0.99)
1082	6.10 (0.88)	4.40 (1.58)	2.90 (1.52)
1083	4.50 (1.08)	4.70 (1.49)	5.80 (1.62)
1084	5.30 (1.64)	4.30 (1.77)	4.70 (1.25)
1091	6.90 (0.32)	6.60 (0.52)	3.30 (1.25)
1092	6.80 (0.42)	6.20 (0.92)	3.20 (1.32)
1093	6.50 (1.08)	5.40 (0.84)	4.90 (0.99)
1094	6.40 (1.07)	4.00 (2.49)	5.44 (1.13)
1101	6.50 (1.58)	6.80 (0.42)	2.00 (1.33)
1102	7.00 (0.00)	7.00 (0.00)	1.80 (1.32)
1103	5.90 (0.99)	5.20 (1.03)	3.20 (1.55)
1104	5.30 (1.42)	5.10 (2.02)	3.56 (2.01)
1111	6.10 (1.29)	6.60 (0.70)	2.20 (1.14)
1112	4.30 (1.70)	5.20 (1.69)	2.70 (1.16)
1113	5.70 (1.64)	6.80 (0.42)	3.30 (1.06)
1114	5.50 (0.97)	6.50 (0.85)	3.50 (1.60)
1121	6.90 (0.32)	6.50 (0.71)	2.70 (1.16)
1122	6.90 (0.32)	6.50 (0.53)	3.67 (1.50)
1123	6.10 (0.74)	4.50 (1.51)	5.44 (1.13)
1124	5.20 (1.40)	5.70 (0.67)	4.50 (0.85)

1131	5.60 (1.71)	5.00 (1.56)	2.70 (1.16)
1132	5.40 (1.84)	4.80 (1.55)	2.22 (0.97)
1133	5.20 (1.93)	5.40 (1.17)	6.00 (0.82)
1134	4.80 (1.55)	6.20 (0.92)	5.60 (0.97)
1141	6.80 (0.63)	6.10 (0.88)	3.60 (1.07)
1142	6.70 (0.67)	5.40 (2.01)	2.40 (0.97)
1143	5.50 (1.35)	5.80 (1.03)	4.10 (1.45)
1144	6.70 (0.95)	5.90 (0.88)	3.22 (1.09)
1151	5.90 (1.29)	4.90 (1.45)	4.90 (1.10)
1152	5.90 (0.88)	4.70 (1.64)	5.25 (1.58)
1153	5.50 (0.85)	4.90 (1.85)	5.20 (1.23)
1154	5.10 (1.79)	4.50 (1.78)	5.33 (1.50)
1161	6.30 (0.82)	4.00 (1.70)	3.12 (1.25)
1162	6.80 (0.42)	5.40 (1.51)	4.10 (1.10)
1163	5.80 (1.03)	5.30 (1.16)	3.70 (1.25)
1164	6.00 (1.25)	6.00 (0.67)	4.78 (1.30)
2011	5.40 (1.90)	6.40 (0.84)	3.10 (0.99)
2012	6.00 (1.12)	5.70 (2.06)	4.11 (1.17)
2013	6.00 (1.15)	6.30 (0.82)	5.00 (1.25)
2014	6.10 (0.88)	6.10 (1.29)	4.44 (1.13)
2021	5.56 (1.13)	5.20 (1.40)	3.44 (1.67)
2022	6.00 (1.15)	5.56 (0.88)	2.30 (0.95)
2023	6.11 (1.05)	5.11 (1.62)	4.00 (1.32)
2024	5.80 (1.03)	5.40 (1.96)	3.22 (1.48)
2031	6.33 (1.00)	5.56 (1.13)	2.67 (1.41)
2032	5.56 (1.13)	6.10 (0.88)	3.67 (1.73)
2033	6.70 (0.67)	6.30 (0.82)	5.10 (1.29)

2034	5.00 (1.33)	5.40 (2.46)	6.10 (1.10)
2041	6.22 (1.09)	6.40 (0.84)	4.00 (1.66)
2042	6.56 (0.53)	6.22 (1.30)	4.90 (0.74)
2043	6.30 (0.82)	5.78 (1.20)	4.10 (1.60)
2044	6.56 (0.73)	5.44 (1.42)	4.22 (1.56)
2051	7.00 (0.00)	6.10 (0.99)	4.30 (1.34)
2052	6.40 (0.97)	6.00 (1.12)	4.00 (1.70)
2053	6.80 (0.63)	4.70 (0.82)	4.60 (1.17)
2054	6.44 (0.73)	5.33 (1.41)	4.90 (1.10)
2061	6.00 (1.50)	5.78 (1.20)	4.22 (1.72)
2062	5.80 (1.62)	5.33 (1.12)	4.40 (1.65)
2063	5.80 (1.93)	6.40 (0.84)	4.40 (1.65)
2064	6.80 (0.42)	6.00 (1.56)	4.10 (1.52)
2071	6.90 (0.32)	5.50 (1.08)	4.90 (1.10)
2072	6.40 (0.70)	6.80 (0.42)	5.10 (1.10)
2073	6.44 (1.01)	4.89 (1.45)	5.44 (1.24)
2074	4.20 (1.48)	6.30 (1.06)	5.80 (1.03)
2081	5.44 (1.42)	6.22 (0.83)	4.20 (0.79)
2082	5.67 (1.58)	6.10 (0.88)	3.00 (1.58)
2083	6.11 (1.05)	5.44 (1.33)	3.44 (1.94)
2084	5.80 (1.03)	5.70 (1.34)	4.11 (1.76)
2091	5.78 (0.97)	6.20 (0.92)	3.67 (1.41)
2092	5.56 (1.59)	5.00 (1.41)	3.70 (0.95)
2093	4.50 (1.78)	5.90 (1.10)	3.80 (1.14)
2094	4.78 (2.11)	4.67 (1.22)	5.00 (1.41)
2101	6.44 (0.73)	5.89 (1.36)	3.44 (1.51)
2102	5.30 (1.25)	5.50 (1.08)	4.20 (1.23)

2103	5.67 (1.58)	5.60 (1.17)	3.11 (1.17)
2104	5.44 (1.13)	5.89 (1.17)	4.80 (0.63)
2111	6.56 (0.73)	6.80 (0.42)	2.67 (1.66)
2112	6.90 (0.32)	5.90 (1.45)	3.40 (0.97)
2113	5.60 (1.17)	5.56 (0.73)	3.60 (1.43)
2114	4.67 (1.94)	5.00 (1.58)	4.11 (1.62)
2121	4.90 (1.60)	4.50 (2.12)	2.67 (1.22)
2122	6.20 (0.79)	3.50 (1.18)	3.20 (1.48)
2123	5.56 (1.33)	4.11 (1.54)	3.44 (1.81)
2124	5.60 (1.07)	4.90 (2.47)	4.50 (1.27)
2131	6.70 (0.67)	5.10 (1.45)	3.50 (1.58)
2132	6.78 (0.44)	5.11 (1.36)	3.33 (1.58)
2133	6.10 (0.88)	5.90 (1.52)	4.30 (1.57)
2134	6.44 (0.53)	5.67 (1.87)	4.60 (1.35)
2141	6.10 (1.60)	6.60 (0.52)	4.40 (1.58)
2142	6.56 (0.53)	5.67 (2.06)	4.50 (0.97)
2143	6.00 (0.94)	4.80 (2.30)	4.80 (1.62)
2144	5.50 (1.51)	4.50 (2.22)	4.60 (1.58)
2151	7.00 (0.00)	6.44 (0.88)	2.89 (1.83)
2152	6.89 (0.33)	6.33 (2.00)	2.70 (1.34)
2153	6.50 (0.53)	5.00 (1.63)	3.00 (0.94)
2154	4.60 (2.01)	4.11 (2.15)	3.60 (1.43)
2161	6.00 (1.25)	6.50 (0.97)	3.33 (1.58)
2162	6.00 (1.63)	6.30 (1.25)	3.30 (1.34)
2163	5.60 (1.84)	5.11 (1.83)	3.70 (1.34)
2164	5.44 (1.81)	5.33 (1.22)	3.30 (1.16)
3011	4.70 (2.67)	5.30 (1.49)	3.90 (1.79)

3012	3.80 (2.35)	5.56 (2.35)	4.44 (2.01)
3013	5.40 (1.51)	4.90 (1.85)	5.80 (0.92)
3014	5.50 (2.46)	4.80 (1.75)	4.80 (1.14)
3021	7.00 (0.00)	6.40 (0.97)	2.80 (1.48)
3022	7.00 (0.00)	6.44 (0.88)	2.78 (1.72)
3023	4.50 (2.17)	3.90 (1.66)	5.30 (1.25)
3024	4.90 (1.91)	5.00 (1.70)	5.50 (1.08)
3031	5.80 (1.93)	6.70 (0.67)	2.90 (1.60)
3032	5.60 (1.51)	6.30 (0.82)	3.80 (1.75)
3033	5.50 (2.01)	6.78 (0.67)	3.22 (1.48)
3034	6.10 (0.88)	6.90 (0.32)	4.10 (1.10)
3041	5.80 (1.93)	4.70 (2.50)	2.10 (1.29)
3042	6.00 (0.94)	5.70 (2.06)	1.90 (0.99)
3043	5.50 (1.43)	6.00 (1.25)	3.30 (1.34)
3044	5.20 (1.40)	4.10 (2.42)	3.90 (1.91)
3051	5.20 (2.20)	5.60 (2.07)	2.60 (1.43)
3052	6.10 (1.91)	5.00 (2.12)	3.56 (2.13)
3053	5.20 (2.10)	4.33 (2.18)	4.56 (1.13)
3054	6.40 (0.97)	5.40 (1.71)	4.50 (1.08)
3061	5.40 (2.01)	6.11 (1.69)	3.89 (2.03)
3062	4.90 (1.73)	6.60 (0.52)	4.40 (1.26)
3063	4.50 (2.12)	6.80 (0.42)	6.10 (1.20)
3064	5.60 (1.84)	6.89 (0.33)	5.33 (0.87)
3071	7.00 (0.00)	6.22 (1.09)	2.22 (0.83)
3072	6.90 (0.32)	6.30 (0.67)	2.80 (0.92)
3073	6.60 (0.70)	5.20 (1.87)	4.60 (1.43)
3074	5.70 (1.34)	5.20 (1.40)	4.00 (1.33)

3081	6.60 (0.70)	6.40 (0.84)	4.30 (1.16)
3082	6.50 (0.71)	6.11 (1.27)	4.44 (0.73)
3083	5.20 (2.25)	5.90 (1.85)	5.30 (1.64)
3084	5.40 (2.17)	5.30 (1.95)	4.80 (0.79)
3091	6.00 (2.00)	6.10 (1.85)	3.10 (1.20)
3092	6.50 (1.27)	5.80 (1.14)	3.60 (1.71)
3093	6.00 (1.05)	6.44 (1.01)	4.00 (1.41)
3094	5.70 (2.00)	5.70 (1.95)	5.20 (1.03)
3101	3.80 (1.81)	6.00 (0.94)	4.10 (1.52)
3102	4.80 (2.04)	4.30 (2.06)	4.40 (1.51)
3103	4.50 (1.08)	6.00 (0.94)	3.90 (1.20)
3104	3.80 (0.92)	5.78 (1.30)	4.33 (1.22)
3111	5.20 (1.81)	3.70 (1.57)	4.10 (1.10)
3112	6.10 (0.57)	5.20 (1.81)	4.10 (1.10)
3113	5.20 (1.75)	4.80 (1.32)	4.60 (0.97)
3114	6.40 (0.52)	4.11 (1.54)	4.56 (0.88)
3121	4.90 (2.02)	4.40 (2.22)	3.90 (1.10)
3122	5.50 (1.58)	5.50 (1.18)	3.90 (1.73)
3123	4.80 (1.62)	4.00 (1.63)	3.00 (1.56)
3124	4.00 (1.83)	3.70 (1.49)	4.30 (0.95)
3131	4.90 (0.88)	4.30 (1.34)	4.30 (1.49)
3132	5.20 (1.81)	4.30 (1.25)	4.80 (1.03)
3133	6.30 (1.06)	6.30 (0.67)	5.80 (1.23)
3134	5.50 (1.27)	4.70 (1.77)	5.40 (1.26)
3141	4.20 (1.55)	5.89 (1.05)	4.11 (1.05)
3142	3.90 (1.79)	6.50 (0.71)	4.10 (1.29)
3143	4.60 (1.65)	5.50 (0.97)	4.80 (1.32)

3144	4.80 (1.81)	6.10 (0.99)	5.20 (1.14)
3151	5.70 (1.95)	4.90 (1.52)	4.30 (1.34)
3152	6.20 (1.87)	4.80 (2.30)	4.00 (1.05)
3153	5.70 (0.95)	5.67 (1.41)	6.33 (0.87)
3154	5.40 (1.65)	5.30 (2.36)	5.40 (0.84)
3161	6.40 (1.58)	5.00 (2.00)	4.90 (1.37)
3162	6.40 (0.97)	4.70 (1.64)	3.80 (1.23)
3163	4.30 (2.16)	5.70 (1.16)	4.20 (1.48)
3164	5.10 (1.45)	5.67 (1.00)	3.89 (1.62)
4011	6.50 (0.53)	5.30 (1.89)	3.50 (1.35)
4012	6.20 (0.79)	6.40 (0.70)	2.80 (1.32)
4013	5.30 (1.42)	5.50 (1.27)	5.10 (1.10)
4014	5.50 (1.18)	4.90 (1.79)	4.44 (1.24)
4021	6.90 (0.32)	7.00 (0.00)	1.70 (1.49)
4022	6.90 (0.32)	6.90 (0.32)	2.20 (1.03)
4023	6.10 (0.88)	5.20 (1.81)	3.11 (0.93)
4024	5.56 (1.24)	5.90 (1.45)	3.10 (1.20)
4031	6.00 (0.67)	5.70 (0.82)	1.40 (0.84)
4032	6.44 (0.73)	4.40 (1.71)	3.30 (1.42)
4033	5.60 (0.97)	4.40 (1.90)	4.00 (1.49)
4034	4.70 (1.57)	4.40 (1.51)	3.90 (1.79)
4041	6.90 (0.32)	6.80 (0.42)	1.70 (0.82)
4042	6.80 (0.42)	5.56 (1.88)	1.75 (0.71)
4043	6.70 (0.67)	6.00 (0.94)	2.00 (1.12)
4044	6.40 (0.84)	5.50 (1.35)	2.60 (1.26)
4051	6.56 (0.73)	5.20 (1.32)	2.70 (1.57)
4052	6.70 (0.48)	6.00 (1.63)	2.60 (1.43)

4053	5.70 (1.16)	5.40 (1.96)	4.67 (1.50)
4054	6.50 (0.71)	5.70 (1.70)	4.30 (1.42)
4061	6.70 (0.95)	5.90 (1.45)	4.80 (1.48)
4062	6.50 (1.27)	6.30 (1.06)	4.44 (1.33)
4063	6.22 (1.39)	5.20 (1.40)	3.00 (1.33)
4064	5.20 (2.04)	5.80 (1.14)	4.50 (1.51)
4071	5.80 (2.10)	4.00 (2.29)	2.50 (1.31)
4072	6.90 (0.32)	5.80 (1.81)	2.80 (1.40)
4073	6.90 (0.32)	5.90 (0.74)	4.33 (1.32)
4074	5.30 (1.57)	4.30 (1.89)	6.10 (0.88)
4081	7.00 (0.00)	6.80 (0.63)	1.60 (0.97)
4082	7.00 (0.00)	6.90 (0.32)	1.80 (1.62)
4083	5.90 (1.29)	5.30 (1.70)	4.11 (1.69)
4084	6.60 (0.70)	4.90 (1.79)	3.40 (0.97)
4091	6.90 (0.32)	5.30 (1.64)	3.50 (1.72)
4092	6.80 (0.42)	5.90 (1.29)	3.20 (1.55)
4093	5.44 (1.24)	5.00 (1.56)	3.10 (1.37)
4094	5.50 (0.97)	5.00 (1.70)	4.30 (1.06)
4101	6.56 (0.53)	5.40 (1.07)	3.80 (1.03)
4102	6.70 (0.48)	5.80 (1.75)	4.33 (1.66)
4103	6.60 (1.26)	5.67 (1.22)	5.00 (2.20)
4104	6.60 (0.84)	6.10 (1.37)	4.00 (1.25)
4111	4.40 (2.01)	4.90 (0.88)	4.30 (1.34)
4112	5.20 (1.62)	4.11 (2.09)	2.75 (1.16)
4113	6.10 (1.60)	4.90 (1.97)	4.67 (1.58)
4114	6.10 (0.88)	5.10 (1.45)	4.90 (1.73)
4121	6.40 (0.97)	4.50 (1.72)	1.10 (0.32)

4122	6.80 (0.42)	4.20 (2.04)	3.80 (1.32)
4123	6.60 (0.70)	4.40 (1.58)	4.90 (0.99)
4124	6.89 (0.33)	5.10 (1.73)	4.50 (1.18)
4131	5.60 (0.97)	4.70 (1.57)	2.50 (2.07)
4132	5.40 (1.43)	6.22 (1.09)	2.25 (1.28)
4133	4.40 (1.07)	4.50 (1.58)	2.22 (1.30)
4134	5.30 (0.82)	5.30 (0.95)	2.10 (0.99)
4141	6.90 (0.32)	6.00 (2.11)	1.60 (1.58)
4142	7.00 (0.00)	6.40 (0.84)	1.60 (1.07)
4143	5.70 (1.64)	4.80 (1.40)	2.90 (1.45)
4144	5.30 (2.31)	6.60 (0.52)	3.30 (1.57)
4151	6.30 (1.49)	5.90 (1.45)	1.11 (0.33)
4152	6.60 (1.26)	5.11 (1.96)	2.00 (2.07)
4153	6.78 (0.67)	6.70 (0.48)	2.00 (1.63)
4154	5.90 (1.73)	5.00 (1.89)	2.40 (1.35)
4161	7.00 (0.00)	6.00 (1.41)	2.30 (1.70)
4162	6.80 (0.42)	5.90 (1.91)	2.80 (2.30)
4163	6.70 (0.67)	5.50 (1.65)	4.20 (1.32)
4164	6.90 (0.32)	5.90 (1.60)	4.00 (1.70)

APPENDIX G

Experiment 2. Stimulus Sentences.

B=Buffer, R=Relevant, I=Irrelevant, T=Typical, A=Atypical

T. Going To A Restaurant.

B 1991Jack wanted to take Jane to a nice restaurant for dinner.

B 1992Jack asked Jane to go out with him and she said yes.

RT 1033Jack phoned to make 7:00 pm reservations.

RA 1035Jack phoned to make 4:30 pm reservations.

RT 1053Jack went to pick up Jane, his brownhaired girlfriend.

RA 1055Jack went to pick up Jane, his greenhaired girlfriend.

IT 1063Jane lived in a house on the other side of town.

IA 1065Jane lived in a mobile home on the other side of town.

IT 1073Jack spoke with Jane's father while waiting for her.

IA 1075Jack spoke with Jane's step-mother while waiting for her.

RT 1083Jack and his girlfriend took his car to the restaurant.

RA 1085Jack and his girlfriend took the subway to the restaurant.

IT 1104There were some businessmen waiting to be seated.

IA 1105There were some boy scouts waiting to be seated.

RT 1124Jack and his girlfriend were shown to their table, which was near a wall.

RA 1125Jack and his girlfriend were shown to their table, which was near a fountain.

IT 1133Jack sat at his table and adjusted his tie.

IA 1135Jack sat at his table and tied his shoelaces.

RT 1143Jack ordered a rum and coke.

RA 1145Jack ordered a cognac and water.

IT 1153Jack looked around at the ornamental light fixtures on the walls.

IA 1155Jack looked around at the animal heads on the walls.

RT 1163Jack and Jane were given menus, which were printed in booklets.

RA 1165Jack and Jane were given menus, which were carved on wooden boards.

IT 1173Jack overheard the people talking to the waiter at the next table.

IA 1175Jack overheard the people talking on the telephone at the next table.

RT 1183Jack ordered the steak.

RA 1185Jack ordered the squid.

IT 1193There was a man with curly hair across the room.

IA 1195There was a man with a seeing eye dog across the room.

IT 1213Jack saw a friend and nodded to him.

IA 1215Jack saw his older brother and nodded to him.

RT 1223Soon the well-prepared meal was served.

RA 1225Soon the overcooked meal was served.

IT 1233Jack saw the hostess go into the kitchen.

IA 1235Jack saw the mayor go into the kitchen.

IT 1253Jack noticed the waitresses were wearing long skirts.

IA 1255Jack noticed the waitresses were wearing medieval gowns.

RT 1263Later, Jack ordered cheesecake for dessert.

RA 1265Later, Jack ordered stewed prunes for dessert.

IT 1273Jack showed Jane some snapshots of his vacation he had in his wallet.

IA 1275Jack showed Jane some snapshots of his wedding he had in his wallet.

RT 1293The expensive bill for the evening was presented.

RA 1295The three-page bill for the evening was presented.

RT 1303Jack paid the check, using his Master Charge card.

RA 1305Jack paid the check, using his Esso charge card.

IT 1313Jack put his pen back in his pocket before leaving.

IA 1315Jack put his saccarine packets in his pocket before leaving.

RT 1323Jack left an average tip for the waitress.

RA 1325Jack left a penny tip for the waitress.

B 1993Jack and his girlfriend left the restaurant.

B 1994Jack asked Jane if he could see her again soon.

T. Moving To A New Apartment.

B 2991Jack was going to move to a new apartment.

B 2992Jack's friend Bill came over to help him move.

IT 2013That morning, Jack had a bowl of cereal for breakfast before starting.

IA 2015That morning, Jack had some buttered scones for breakfast before starting.

RT 2023Jack went to get the one-ton truck he had rented.

RA 2025Jack went to get the antique truck he had rented.

RT 2034Jack found some cardboard boxes at a grocery store.

RA 2035Jack found some cardboard boxes at a pet store.

RT 2063Jack began to pack up the glasses in the kitchen.

RA 2065Jack began to pack up the pasta maker in the kitchen.

IT 2074Jack's friend admired a decorative wall hanging Jack had bought overseas.

IA 2075Jack's friend admired an oriental fan Jack had bought overseas.

RT 2083Jack went to his bedroom to pack his shirts.

RA 2085Jack went to his bedroom to pack his dressing gowns.

IT 2094Jack tried on an old suit he never wore anymore.

IA 2095Jack tried on a pair of leather pants he never wore anymore.

IT 2103Jack was interrupted by the paperboy at the door.

IA 2105Jack was interrupted by a bill collector at the door.

RT 2113Jack dismantled the bookcase before moving it.

RA 2115Jack dismantled the end tables before moving them.

IT 2123Jack found a quarter under the sofa cushions.

IA 2125Jack found a traveler's cheque under the sofa cushions.

RT 2134Jack carefully packed his framed pictures of landscapes.

RA 2135Jack carefully packed his framed pictures of submarines.

IT 2143Jack went out to buy a hamburger at noon for lunch.

IA 2145Jack went out to buy some watermelon at noon for lunch.

IT 2164Jack found a pair of cuff links that had been lost.

IA 2165Jack found a diamond ring that had been lost.

RT 2173The collection of rock music was next to be packed.

RA 2175The collection of chamber music was next to be packed.

IT 2183While packing, Jack and his friend planned on going to a bar on Saturday.

IA 2185While packing, Jack and his friend planned on a wargames evening for Saturday.

RT 2193Jack packed up his hockey equipment.

RA 2195Jack packed up his mountain climbing equipment.

IT 2203There was an ad for a new comedy movie in the paper Jack used for wrapping china.

IA 2205There was an ad for a new soft porn film in the paper Jack used for wrapping china.

RT 2213Jack and his friend quickly loaded the truck.

RA 2215Jack and his friend haphazardly loaded the truck.

IT 2244Jack saw a stray cat sitting on the sidewalk.

IA 2245Jack saw a stray cat sitting under a birdhouse.

IT 2263A collie barked at the moving vehicle as it went by.

IA 2265An elkhound barked at the moving vehicle as it went by.

RT 2274Jack found his new parking place behind the apartment.

RA 2275Jack found his new parking spot a block from the apartment.

RT 2293They carried Jack's things up in the elevator.

RA 2295They carried Jack's things up the fire escape.

IT 2303A fly flew in the open window.

IA 2305A June bug flew in the open window.

RT 2313They unpacked and carried the boxes out to the garbage.

RA 2315They unpacked and threw the boxes into the parking lot.

B 2993Jack returned the truck to the rental office late that evening.

B 2994Jack returned to his new home to settle in.

T. Going To A Wedding.

B 3991Jack's friend Sam was getting married.

B 3992Sam asked Jack to be his best man.

RT 3023Jack bought a toaster as a present for the couple.

RA 3025Jack bought a fire extinguisher as a present for the couple.

RT 3053The night before, Jack threw a stag party with lots to drink for the groom.

RA 3055The night before, Jack threw a stag party out in the bush for the groom.

RT 3063Jack went to pick up the groom at his house.

RA 3065Jack went to pick up the groom at the Y.M.C.A.

RT 3093Jack went in the church after parking in the parking lot.

RA 3095Jack went in the church after parking by a fire hydrant.

IT 3103The groom's invited friends were arriving.

IA 3105The groom's invited street gang was arriving.

IT 3113The bride's mother was in tears of happiness.

IA 3115The bride's daughter was in tears of happiness.

RT 3124Jack carried the ring in his jacket pocket so he wouldn't lose it.

RA 3125Jack carried the ring in his shoe so he wouldn't lose it.

IT 3133The bridesmaids looked pretty in their yellow gowns.

IA 3135The bridesmaids looked pretty in their grey gowns.

RT 3143Afterwards, they posed for photographs on the church lawn.

RA 3145Afterwards, they posed for photographs at a tree farm.

RT 3164That evening, Jack went to the church hall for the reception.

RA 3165That evening, Jack went to a ski lodge for the reception.

IT 3174There were several presents wrapped with pretty wrapping paper in the pile of gifts.

IA 3175There were several presents wrapped in plain brown paper in the pile of gifts.

IT 3183Soon the wedding buffet was laid out.

IA 3185Soon the wine and cheese wedding meal was served.

RT 3204Jack danced several dances with one of the bridesmaids.

RA 3205Jack danced several dances with the flowergirl.

IT 3213Children were playing tag around the dance floor.

IA 3215Children were playing hopscotch around the dance floor.

RT 3223Jack took a lot of pictures of the dancing.

RA 3225Jack took a lot of pictures of the wedding cake.

IT 3234Jack met an aunt he hadn't seen for years.

IA 3235Jack met his ex-wife that he hadn't seen for years.

IT 3253Jack danced all the waltzes.

IA 3255Jack danced all the tangos.

IT 3263A late lunch of sandwiches was served.

IA 3265A late lunch of escargot was served.

RT 3273Jack took a collection in a cardboard box for the new couple.

RA 3275Jack took a collection in a beer box for the new couple.

IT 3283The bride threw her bouquet of roses.

IA 3285The bride threw her bouquet of dandelions.

IT 3293Jack stepped outside for a moment to talk to a friend.

IA 3295Jack stepped outside for a moment to change a tire for someone.

RT 3303Jack threw confetti at the couple as they left.

RA 3305Jack hung garlands on the couple as they left.

RT 3324Jack received a gold chain from the groom for helping out.

RA 3325Jack received an autographed baseball from the groom for helping out.

IT 3334Jack continued visiting with friends after the couple left.

IA 3335Jack started to play caps with friends after the couple left.

B 3993Jack took some wedding cake as a souvenier of the wedding.

B 3994Late that night, Jack drove his car home.

T. Going On A Trip With A Commercial Airline.

B 4991Jack had two weeks holiday coming up.

B 4992Jack decided to fly to another city for his holidays.

RT 4013Jack got some information about the ski areas at his holiday destination.

RA 4015Jack got some information about the birdlife at his holiday destination.

IT 4043Jack gave away his tickets for a football game he would miss while away.

IA 4045Jack gave away his tickets for a debutante's party he would miss while away.

RT 4054Jack picked up his tickets from the agent.

RA 4055Jack got his tickets in the mail.

RT 4083Jack packed some things in a suitcase.

RA 4085Jack packed some things in a steamer trunk.

IT 4103Jack saw yellow cabs lined up outside the airport.

IA 4105Jack saw horse-drawn taxis lined up outside the airport.

IT 4114Jack bought some post cards at the duty free store.

IA 4115Jack bought some chewing tobacco at the duty free store.

IT 4123Jack had a cheeseburger in the airport cafeteria.

IA 4125Jack had a plate of potato skins in the airport cafeteria.

IT 4133Jack watched the planes while waiting in the departure lounge.

IA 4135Jack practised yoga while waiting in the departure lounge.

RT 4143A steward announced it was time to board the plane.

RA 4145A luggage handler announced it was time to board the plane.

IT 4153Jack helped an old woman who was struggling with her bags.

IA 4155Jack helped a beautiful girl who was struggling with her bags.

RT 4163Jack walked through the metal detector passageway at security.

RA 4165Jack was body-searched at security.

IT 4174A flight just in from Toronto was unloading.

IA 4175A flight just in from Berlin was unloading.

RT 4193Jack boarded the plane via the loading ramp.

RA 4195Jack walked across the runway and boarded the plane.

RT 4203Jack found his seat in the front on board.

RA 4205Jack found his seat in the stewardess' section on board.

RT 4213Jack watched the stewardess demonstrate how to use the oxygen masks.

RA 4215Jack watched the stewardess demonstrate how to inflate a life raft.

IT 4223Jack saw a 747 taking off ahead of them.

IA 4225Jack saw a helicopter taking off ahead of them.

IT 4244A stewardess walked by carrying a tray for another passenger.

IA 4245A stewardess walked by carrying binoculars for another passenger.

IT 4253Jack watched the inflight detective movie.

IA 4255Jack watched the inflight foreign language movie.

RT 4264The pilot announced the time of arrival over the PA system.

RA 4265The pilot announced over the PA system that a volcano could be seen below on the left.

IT 4273Jack had a long talk with a businessman sitting next to him.

IA 4275Jack had a long talk with an acrobat sitting next to him.

IT 4293Jack saw another passenger putting on make-up in preparation for landing.

IA 4295Jack saw another passenger trimming his moustache in preparation for landing.

RT 4303With a bump, the plane landed.

RA 4305With a crunch, the plane landed.

RT 4314Jack walked off the plane.

RA 4315Jack pushed his way off the plane.

RT 4323Jack picked up his luggage from the conveyor belt.

RA 4325Jack picked up his luggage from lost and found.

B 4993Jack left the airport by taxi.

B 4994Jack had a wonderful time on his holiday.

APPENDIX H

Experiment 2. Stimulus Ratings.

Matched by statement number with Appendix G.

Stno.	Typ		Rel		Spec	
	Mean	SD	Mean	SD	Mean	SD
1033	6.40	(0.70)	6.90	(0.32)	4.40	(1.43)
1035	2.80	(1.69)	5.80	(1.69)	4.89	(1.17)
1053	4.60	(2.12)	6.10	(1.52)	5.30	(1.34)
1055	1.20	(0.42)	4.80	(1.87)	5.11	(1.54)
1063	4.20	(1.99)	3.30	(2.11)	2.70	(1.34)
1065	3.00	(1.83)	2.90	(1.79)	5.11	(1.36)
1073	5.50	(1.65)	3.60	(1.07)	4.78	(1.64)
1075	3.90	(1.79)	3.70	(1.34)	4.56	(1.59)
1083	6.60	(0.70)	4.50	(1.72)	3.75	(1.39)
1085	2.50	(1.08)	5.20	(0.92)	5.10	(0.99)
1104	4.60	(1.51)	2.20	(1.75)	3.50	(1.41)
1105	2.20	(1.14)	2.40	(1.26)	3.11	(1.36)
1124	5.80	(0.79)	5.00	(1.70)	4.50	(1.77)
1125	3.70	(1.42)	5.80	(1.40)	5.20	(0.92)
1133	4.80	(1.48)	3.50	(1.35)	4.40	(1.43)
1135	2.70	(1.06)	2.70	(1.89)	3.40	(1.58)
1143	4.50	(1.08)	4.70	(1.49)	5.80	(1.62)
1145	2.40	(1.51)	4.30	(1.89)	4.78	(1.09)
1153	4.70	(1.49)	2.40	(1.26)	3.63	(1.19)
1155	3.70	(1.89)	2.70	(1.49)	4.20	(1.14)
1163	6.50	(1.08)	5.40	(0.84)	4.90	(0.99)

1165	2.50 (1.43)	5.50 (1.35)	6.10 (0.88)
1173	5.20 (1.32)	2.90 (1.45)	4.00 (1.49)
1175	2.20 (1.23)	2.70 (1.83)	3.38 (1.60)
1183	5.90 (0.99)	5.20 (1.03)	3.20 (1.55)
1185	2.70 (1.49)	4.60 (1.84)	4.00 (1.76)
1193	4.60 (1.58)	1.90 (0.99)	4.30 (1.34)
1195	2.10 (1.37)	1.70 (1.34)	5.60 (1.35)
1213	4.50 (1.43)	3.50 (1.08)	2.67 (1.41)
1215	2.20 (1.81)	2.40 (1.17)	4.80 (0.79)
1223	5.70 (1.64)	6.80 (0.42)	3.30 (1.06)
1225	2.80 (1.14)	6.10 (0.99)	4.20 (1.32)
1233	4.30 (2.11)	1.40 (0.52)	3.50 (1.20)
1235	1.50 (0.53)	1.70 (0.95)	3.40 (1.26)
1253	4.30 (2.11)	3.60 (1.35)	4.60 (1.17)
1255	2.30 (1.42)	3.50 (1.84)	5.80 (1.14)
1263	5.20 (1.93)	5.40 (1.17)	6.00 (0.82)
1265	2.40 (1.51)	4.30 (1.42)	5.70 (1.16)
1273	4.20 (1.69)	3.10 (0.99)	4.50 (1.31)
1275	1.30 (0.67)	3.20 (1.87)	4.40 (2.12)
1293	5.50 (1.35)	5.80 (1.03)	4.10 (1.45)
1295	1.90 (0.74)	4.10 (1.66)	4.30 (0.82)
1303	5.50 (0.85)	4.90 (1.85)	5.20 (1.23)
1305	1.10 (0.32)	5.60 (1.78)	5.40 (1.35)
1313	3.90 (1.79)	2.50 (1.18)	3.80 (1.32)
1315	2.20 (1.14)	3.00 (1.56)	5.62 (0.92)
1323	5.80 (1.03)	5.30 (1.16)	3.70 (1.25)
1325	1.10 (0.32)	5.10 (2.02)	4.78 (1.99)

2013	5.22 (0.83)	2.67 (1.50)	4.50 (1.08)
2015	2.10 (1.10)	2.40 (1.43)	5.44 (1.24)
2023	6.00 (1.15)	6.30 (0.82)	5.00 (1.25)
2025	1.40 (0.70)	5.60 (1.26)	4.90 (1.29)
2034	5.80 (1.03)	5.40 (1.96)	3.22 (1.48)
2035	4.00 (0.94)	5.20 (1.93)	3.50 (1.18)
2063	6.30 (0.82)	5.78 (1.20)	4.10 (1.60)
2065	3.00 (2.11)	5.90 (0.99)	5.10 (1.37)
2074	4.10 (1.60)	2.00 (1.05)	5.33 (1.50)
2075	3.20 (1.62)	1.20 (0.42)	5.20 (1.48)
2083	6.80 (0.63)	4.70 (0.82)	4.60 (1.17)
2085	2.80 (2.04)	5.50 (1.58)	3.89 (2.15)
2094	4.33 (1.80)	1.70 (0.82)	3.78 (1.48)
2095	3.30 (1.83)	3.00 (1.63)	5.50 (0.97)
2103	3.80 (1.69)	2.22 (1.64)	4.10 (1.60)
2105	2.11 (1.27)	3.56 (2.19)	3.33 (1.87)
2113	5.80 (1.93)	6.40 (0.84)	4.40 (1.65)
2115	3.78 (2.33)	5.22 (1.56)	4.60 (0.52)
2123	5.89 (1.17)	2.10 (1.66)	4.11 (1.69)
2125	1.89 (1.27)	3.44 (1.13)	4.80 (1.23)
2134	4.20 (1.48)	6.30 (1.06)	5.80 (1.03)
2135	2.89 (1.96)	5.00 (1.12)	6.00 (1.05)
2143	5.00 (1.63)	2.00 (1.32)	4.30 (1.34)
2145	2.30 (1.83)	1.70 (1.06)	4.70 (1.77)
2164	5.44 (1.13)	2.50 (1.08)	3.33 (1.12)
2165	1.50 (1.27)	3.10 (1.73)	4.00 (1.63)
2173	4.50 (1.78)	5.90 (1.10)	3.80 (1.14)

2175	2.20 (1.75)	4.89 (1.83)	5.10 (1.60)
2183	5.00 (1.66)	3.56 (1.67)	5.40 (1.07)
2185	3.00 (1.89)	1.90 (1.29)	5.80 (1.55)
2193	5.67 (1.58)	5.60 (1.17)	3.11 (1.17)
2195	3.90 (2.13)	5.50 (1.51)	4.40 (0.70)
2203	5.44 (1.24)	2.50 (1.35)	5.33 (2.29)
2205	3.10 (1.73)	1.67 (1.32)	6.50 (0.85)
2213	5.60 (1.17)	5.56 (0.73)	3.60 (1.43)
2215	2.78 (1.86)	5.56 (1.88)	4.40 (1.35)
2244	4.50 (1.27)	1.00 (0.00)	3.50 (1.51)
2245	2.67 (1.12)	1.30 (0.67)	3.89 (1.36)
2263	4.30 (2.16)	1.50 (0.71)	3.90 (1.52)
2265	3.11 (1.45)	1.22 (0.44)	4.11 (2.26)
2274	6.44 (0.53)	5.67 (1.87)	4.60 (1.35)
2275	3.10 (2.33)	6.20 (1.23)	5.00 (1.41)
2293	6.50 (0.53)	5.00 (1.63)	3.00 (0.94)
2295	2.80 (1.48)	4.70 (1.70)	2.89 (1.27)
2303	5.33 (1.22)	1.56 (1.33)	2.44 (1.42)
2305	2.40 (2.01)	1.20 (0.42)	4.50 (1.27)
2313	5.60 (1.84)	5.11 (1.83)	3.70 (1.34)
2315	2.80 (1.40)	4.10 (1.29)	3.40 (1.51)
3023	4.50 (2.17)	3.90 (1.66)	5.30 (1.25)
3025	1.90 (1.29)	5.30 (1.42)	5.80 (1.03)
3053	6.60 (0.52)	6.33 (1.32)	4.56 (1.51)
3055	3.40 (2.07)	6.10 (1.66)	5.90 (0.99)
3063	5.50 (2.01)	6.78 (0.67)	3.22 (1.48)
3065	2.50 (1.27)	6.22 (1.64)	5.33 (0.87)

3093	5.20 (2.10)	4.33 (2.18)	4.56 (1.13)
3095	2.20 (1.23)	3.80 (1.23)	5.60 (0.97)
3103	6.50 (0.97)	3.00 (1.70)	3.40 (1.58)
3105	1.90 (1.91)	2.50 (1.84)	3.80 (1.62)
3113	5.80 (1.14)	2.44 (1.42)	4.78 (2.11)
3115	3.00 (1.89)	3.70 (1.89)	4.70 (1.25)
3124	5.60 (1.84)	6.89 (0.33)	5.33 (0.87)
3125	1.80 (1.14)	6.60 (0.52)	5.30 (1.16)
3133	5.10 (1.85)	2.30 (1.57)	4.70 (1.16)
3135	2.20 (1.32)	2.30 (1.16)	5.30 (1.25)
3143	6.60 (0.70)	5.20 (1.87)	4.60 (1.43)
3145	2.50 (2.01)	6.20 (0.79)	4.50 (1.35)
3164	5.70 (2.00)	5.70 (1.95)	5.20 (1.03)
3165	3.80 (2.62)	5.11 (1.17)	4.56 (1.13)
3174	6.90 (0.32)	2.00 (1.15)	5.80 (1.55)
3175	1.30 (0.67)	1.70 (1.25)	5.70 (1.25)
3183	5.00 (1.70)	3.44 (2.19)	2.67 (0.87)
3185	2.00 (1.15)	3.20 (1.75)	4.50 (1.43)
3204	6.40 (0.52)	4.11 (1.54)	4.56 (0.88)
3205	4.20 (2.04)	3.50 (1.43)	4.70 (1.16)
3213	4.70 (1.77)	2.22 (1.30)	3.11 (1.17)
3215	2.80 (2.10)	1.60 (1.26)	3.70 (1.70)
3223	4.80 (1.62)	4.00 (1.63)	3.00 (1.56)
3225	2.30 (1.49)	4.33 (1.12)	4.00 (1.22)
3234	4.40 (2.01)	1.90 (1.10)	4.40 (1.17)
3235	2.70 (1.95)	1.70 (1.25)	4.80 (0.79)
3253	4.60 (1.71)	2.50 (1.51)	3.90 (1.73)

3255	3.40 (1.78)	3.30 (1.64)	4.40 (2.27)
3263	5.60 (1.71)	2.90 (1.91)	3.40 (1.07)
3265	2.40 (1.51)	2.10 (1.66)	4.50 (1.18)
3273	4.60 (1.65)	5.50 (0.97)	4.80 (1.32)
3275	2.20 (2.10)	5.40 (2.01)	5.10 (1.66)
3283	5.70 (1.95)	3.20 (2.10)	3.50 (1.08)
3285	1.00 (0.00)	2.20 (1.48)	5.30 (1.16)
3293	4.40 (1.90)	1.60 (0.84)	3.90 (1.52)
3295	2.00 (0.82)	1.80 (1.32)	4.90 (1.79)
3303	4.30 (2.16)	5.70 (1.16)	4.20 (1.48)
3305	1.70 (1.06)	4.56 (1.24)	4.11 (1.62)
3324	5.40 (1.65)	5.30 (2.36)	5.40 (0.84)
3325	1.50 (1.27)	5.40 (1.26)	5.60 (1.78)
3334	5.80 (1.69)	4.10 (1.60)	4.20 (1.40)
3335	2.00 (1.15)	1.90 (1.45)	4.60 (1.35)
4013	5.30 (1.42)	5.50 (1.27)	5.10 (1.10)
4015	3.10 (1.20)	4.00 (2.00)	4.70 (1.06)
4043	4.80 (1.62)	2.11 (1.54)	5.50 (1.51)
4045	3.00 (2.21)	2.00 (1.15)	5.90 (0.74)
4054	5.56 (1.24)	5.90 (1.45)	3.10 (1.20)
4055	2.70 (1.25)	5.60 (1.58)	3.80 (1.23)
4083	6.70 (0.67)	6.00 (0.94)	2.00 (1.12)
4085	3.20 (2.30)	5.40 (1.90)	3.00 (1.49)
4103	6.60 (0.70)	3.20 (2.39)	4.50 (1.35)
4105	1.80 (1.03)	1.80 (1.03)	4.33 (1.41)
4114	6.00 (1.05)	2.90 (1.73)	4.44 (1.51)
4115	2.50 (1.27)	1.80 (1.03)	5.20 (1.03)

4123	4.50 (1.18)	3.00 (1.15)	5.50 (1.08)
4125	2.10 (1.10)	1.80 (1.23)	5.80 (1.23)
4133	5.80 (0.92)	3.30 (1.77)	4.22 (1.09)
4135	1.00 (0.00)	2.10 (1.45)	5.00 (1.33)
4143	6.22 (1.39)	5.20 (1.40)	3.00 (1.33)
4145	1.30 (0.67)	6.20 (1.87)	5.00 (1.15)
4153	5.30 (1.34)	3.70 (1.64)	5.40 (1.17)
4155	3.70 (1.49)	2.78 (1.99)	5.62 (1.06)
4163	6.90 (0.32)	5.90 (0.74)	4.33 (1.32)
4165	2.80 (1.87)	4.70 (1.25)	4.60 (1.71)
4174	5.20 (1.69)	2.40 (0.84)	3.89 (1.17)
4175	4.00 (1.94)	1.80 (0.92)	5.00 (1.25)
4193	5.90 (1.29)	5.30 (1.70)	4.11 (1.69)
4195	1.90 (1.29)	5.70 (1.16)	5.00 (1.15)
4203	5.44 (1.24)	5.00 (1.56)	3.10 (1.37)
4205	1.70 (1.57)	5.00 (1.83)	5.40 (1.17)
4213	6.60 (1.26)	5.67 (1.22)	5.00 (2.20)
4215	3.60 (2.50)	5.90 (0.99)	5.40 (1.26)
4223	3.80 (1.87)	2.80 (1.87)	4.60 (1.26)
4225	2.89 (1.76)	1.90 (1.29)	3.40 (1.07)
4244	5.70 (1.83)	2.60 (1.17)	4.30 (1.25)
4245	2.00 (1.15)	3.00 (1.70)	5.60 (0.70)
4253	5.10 (1.45)	2.80 (1.81)	5.20 (1.03)
4255	3.50 (1.72)	3.44 (1.42)	4.88 (1.36)
4264	6.89 (0.33)	5.10 (1.73)	4.50 (1.18)
4265	2.80 (2.10)	4.20 (1.55)	5.89 (1.36)
4273	4.40 (1.07)	3.70 (1.89)	4.00 (0.71)

4275	2.50 (1.35)	3.20 (1.55)	5.50 (1.18)
4293	4.80 (1.75)	2.50 (1.35)	4.22 (1.56)
4295	1.80 (1.23)	1.30 (0.67)	5.00 (2.05)
4303	5.70 (1.64)	4.80 (1.40)	2.90 (1.45)
4305	2.00 (1.89)	5.30 (1.57)	4.40 (1.35)
4314	5.90 (1.73)	5.00 (1.89)	2.40 (1.35)
4315	3.00 (2.05)	4.40 (1.35)	3.70 (1.42)
4323	6.70 (0.67)	5.50 (1.65)	4.20 (1.32)
4325	2.30 (0.67)	5.11 (1.96)	3.88 (1.55)

APPENDIX I

Experimental Instructions

This is a study about the use of computer terminals in education. As you probably know, computers are being used for more and more things these days. Many schools and universities are already using them as aides in education. Rather than going to lectures and reading assigned books, students work through the course on computer terminals, working at their own speed. But it's not yet known if these methods are more effective than traditional classroom methods. And that's what I hope to find out.

What I'm investigating right now is reading speed and working speed. Some participants in this study will be reading some passages and doing some math problems on this terminal, other will be reading the same passages and doing the same math problems on sheets of paper. Then, I'll be able to compare the times it took each group to complete the work.

I'd like you to start by reading some passages on the terminal. By placing your palm on this plate, and by tapping the other plate with your finger, you'll be able to call up the sentences one at a time to the terminal. Read them at your own speed, tapping the plate to call up the next sentence as soon as you've read the one on the screen. Work quickly, but read for comprehension; make sure you understand what you're reading.

The passages you're about to read tell simple stories. In each one, you'll see a series of actions and events that happen to a person named Jack in 4 different situations. There will be a title in capital letters before each of the passages. Treat it just like another line; read it, and tap the plate to get the next sentence. Now, put your hand on the plate and begin when the terminal tells you to do so. It will also tell you when to stop. Any questions?

OK, that part of the study is over. The next part is a series of math problems

which you will do on paper. When I tell you to do so, turn the page over and begin working. Continue until I tell you to stop. Work quickly, but try to find the correct answer for each problem.

Stop. Please put the sheet and pencil aside. When I first gave you the instructions, it was necessary that I didn't tell you everything this study was about. Now, I'd like to explain the second part, and also explain why I didn't tell you about it earlier. This study is about memory. I want to find out what sorts of things people remember, and why they remember them. There are two ways to study memory. One is to let you know that you have to remember everything you have read so you can try to memorize it. The second way is called incidental memory, where we find out what you can remember when you haven't been trying to memorize the material. I want to test your incidental memory for what you read on the terminal, which is why I led you to believe that this study was just about reading time.

Would you now return to the terminal, and put both hands on the plates in front of you. When you're ready to begin, you'll see a series of sentences on the screen just like last time. But as each one comes up, I want you to tell me if you have seen it before. On each trial, I'll push a button and you'll hear a beep. Half a second later, a sentence will come up, and you'll have to decide whether you've seen it before in its exact form, that is, word for word. A tap with your right finger means yes, you have seen it before, a tap with your left means no, you haven't seen it before. You may see some sentences now that are similar to ones you saw before, but answer yes only if it is exactly the same sentence. There won't be any tricks like giving you the same sentence with the same words in a different order, but there may be sentences that are exactly the same with only one or two words changed. As soon as you answer yes or no, the next sentence will appear on the screen. You'll also see the same titles you

saw before. When you get a title, just tap with your right finger, meaning yes, you've seen it before. Any questions? Begin when the terminal tells you to do so, and continue until it tells you to stop.

APPENDIX J

Run Program, Experiment 1.

```
      PROGRAM BGPRES
C
C  PROGRAMMER:  Bruce Galenza
C  USE:  Masters Thesis
C  DATE:  August 4, 1983
C
C
      INTEGER ISUB1,ISUB2,ITENS,LUNA,IFLAG,IFORM,TXNO,STNO,NCHARS,
     &DIMASK,DOMASK,DODATA,DIDATA,FIRST,IDX
      REAL OVERFL
      DIMENSION ITEXT(4),CELL(20,3),ISTAT(20),ITST(20),ISTOUT(64),
     &CELLOUT(20,3),ITIME(80),IRESP(80),ICELNO(20,3),ISELNO(20,3),
     &OVERX(80)
      LOGICAL*1 FNAME(11),GNAME(9),ENAME(11),ALPHA(10),START(28),
     &MOVEC(8),END(26),ERASE(4),TEXT(90,82),LIST(82),OFLOW(82),
     &TITL1(22),TITL2(26),TITL3(19),TITL4(42)
      DATA FNAME/'B','G','1','S','N','N','.','A','C','Q',"0/
      DATA GNAME/'V','E','R','N','.','D','A','T',"0/
      DATA ENAME/'B','G','1','S','N','N','.','T','S','T',"0/
      DATA ALPHA/'0','1','2','3','4','5','6','7','8','9'/
      DATA START/'R','e','a','d','y','.',' ',' ','T','o','u','c','h',
     &' ','p','a','d',' ','t','o',' ','s','t','a','r','t','.',"0/
      DATA ERASE/"033,"133,"062,"112/
      DATA MOVEC/"033,"133,"061,"062,"073,"060,"061,"146/
```

```
      DATA END/'T','h','a','n','k',' ','y','o','u','.',' ',' ',
     &'Y','o','u',' ','m','a','y',' ','r','e','l','a','x','.'/
      DATA TITL1/'G','O','I','N','G',' ','T','O',' ','A',
     &' ','R','E','S','T','A','U','R','A','N','T','.'/
      DATA TITL2/'M','O','V','I','N','G',' ','T','O',' ','A',' ','N',
     &'E','W',' ','A','P','A','R','T','M','E','N','T','.'/
      DATA TITL3/'G','O','I','N','G',' ','T','O',' ','A',' ',
     &'W','E','D','D','I','N','G','.'/
      DATA TITL4/'G','O','I','N','G',' ','O','N',' ','A',' ','T','R',
     &'I','P',' ','W','I','T','H',' ','A',' ','C','O','M','M','E','R',
     &'C','I','A','L',' ','A','I','R','L','I','N','E','.'/
C
C  The program requests from the experimenter the subject number,
C  which form of the 4 texts to be used, and the sequence
C  that the texts are to follow.
C
      TYPE *, 'ENTER SUBJECT NUMBER: nn'
      ACCEPT 100, ISUB1, ISUB2
100   FORMAT (2I1)
      TYPE *, 'ENTER TEXT SEQUENCE:  nnnn'
      ACCEPT 120, (ITEXT(I), I=1,4)
120   FORMAT (4I1)
      TYPE *, 'ENTER FORM OF TEXTS TO BE USED:  n'
      ACCEPT 110, IFORM
110   FORMAT (I1)
C
C  The output file to hold reading times is opened for this subject.
```

```
C
      FNAME(5)= ALPHA(ISUB1+1)
      FNAME(6)= ALPHA(ISUB2+1)
      OPEN(UNIT=16,NAME=FNAME,TYPE='NEW')
C
C  The master file holding all stims is opened.
C
      OPEN(UNIT=17, NAME='FSTIMS.LST',TYPE='OLD')
C
C  The file holding the matrix for the specified form is opened.
C  The matrix holds the condition for presentation-test (ie: GS-D)
C  to be put in "CELL", the statement number to be shown at presentation
C  is put in "ISTAT", and the statement number to be shown at test
C  is put into "ITST".
C
      GNAME(4)=ALPHA(IFORM+1)
      LUNA=IFORM+7
      OPEN(UNIT=LUNA, NAME=GNAME, TYPE='OLD')
      DO 11 I=1,20
      READ(LUNA,102)(CELL(I,K),K=1,3), ISTAT(I), ITST(I)
102   FORMAT(3A1,I3,I3)
11    CONTINUE
C
C  The array that will hold all sentences to be shown at presentation is
C  blanked out.
C  The master stim file is read sentence by sentence; those matching the
C  statement numbers in the presentation matrix are written to "TEXT".
```

```
C  If no " " is found on the line, an overflow beyond 70 characters is
C  indicated.  An " " is written to column 80 of that line to indicate
C  an overflow for the printout routine, and the following line holding
C  the overflow is read in and stored.
C
      DO 21 I=1,90
      DO 21 J=1,80
      TEXT(I,J)=' '
21    CONTINUE
      JJ=0
      DO 10 I=1,4
19      READ(17,101)TXNO,STNO,NCHARS,(LIST(K),K=1,NCHARS)
101     FORMAT(I1,I3,Q,82A1:)
        IF(TXNO .NE. ITEXT(I)) GOTO 19
        DO 15 J=1,20
17        IF(ISTAT(J) .EQ. 0) GOTO 15
          IF(STNO .EQ. ISTAT(J)) GOTO 16
          READ(17,101)TXNO,STNO,NCHARS,(LIST(K),K=1,NCHARS)
          GOTO 17
16        JJ=JJ+1
          DO 18 K=1,NCHARS
            IF(LIST(K).EQ.'<')GOTO 15
            TEXT(JJ,K)=LIST(K)
18        CONTINUE
          TEXT(JJ,80)='<'
          READ(17,101)TXNO,STNO,NCHARS,(LIST(K),K=1,NCHARS)
          GOTO 16
```

```
15          CONTINUE
            REWIND 17
10      CONTINUE
C
C   The "CELL" conditions and sentence numbers used in presentation
C   are written to "CELLOUT" and "ISTOUT" to be stored with the subject's
C   reading time for each sentence.  Number equivalents of cell conditions
C   are added in arrays ICELNO and ISELNO.
C
        J=0
        DO 22 K=1,20
            IF(ISTAT(K).EQ.0)GOTO 22
            J=J+1
            ISTOUT(J)=ISTAT(K)
            DO 24 I=1,3
                CELLOUT(J,I)=CELL(K,I)
                IF(CELLOUT(J,I).NE.'G')GOTO 25
                ICELNO(J,I)=1
25              IF(CELLOUT(J,I).NE.'S')GOTO 68
                ICELNO(J,I)=2
68              IF(CELLOUT(J,I).NE.'X')GOTO 69
                ICELNO(J,I)=3
69              IF(CELLOUT(J,I).NE.'T')GOTO 73
                ICELNO(J,I)=4
73              IF(CELLOUT(J,I).NE.'D')GOTO 24
                ICELNO(J,I)=5
24          CONTINUE
```

```
22      CONTINUE
C
        DO 74 K=1,20
           DO 75 J=1,3
              IF(CELL(K,J).NE.'G')GOTO 76
              ISELNO(K,J)=1
76            IF(CELL(K,J).NE.'S')GOTO 77
              ISELNO(K,J)=2
77            IF(CELL(K,J).NE.'X')GOTO 78
              ISELNO(K,J)=3
78            IF(CELL(K,J).NE.'T')GOTO 79
              ISELNO(K,J)=4
79            IF(CELL(K,J).NE.'D')GOTO 75
              ISELNO(K,J)=5
75         CONTINUE
74      CONTINUE
C
C  The remote terminal is attached.
C
        IERR=MTATCH(2)
        IF(IERR.NE.0) STOP 'Error in MTATCH'
C
C  The clock is initiated, once per program.
C
        CALL CLOCKB(4,-1,,IND)
C
C       The flag stating this is presentation is set.
```

```
C
      IFLAG=0
C
C  The character array that will hold the presented sentences
C  is filled with blanks.
C
 57   DO 20 I=1,82
      LIST(I)=' '
 20   CONTINUE
C
      PAUSE 'Touch return for next phase.'
C
C  The array indicating overflows is blanked.
C
      DO 26 I=1,80
         OVERX(I)=' '
 26   CONTINUE
      IF(IFLAG.EQ.1)GOTO 95
C
C  The subject is instructed to begin, with the start message
C  moved to "LIST" and then displayed on the remote terminal.
C
      DO 70 I=1,29
         LIST(I)=START(I)
70    CONTINUE
      LIST(81)="015
      LIST(82)="012
```

```
      IERR=MTOUT(2,ERASE,4)
      IERR=MTOUT(2,MOVEC,8)
      CALL DOUT(0,"1,IERR,"1)
      IERR=MTOUT(2,LIST,82)
      CALL DOUT(0,"1,IERR,"0)
C
C  Mask is set for the L touchplate.
C  The input is cleared by sending it, via the D.O., a postitive going
C  pulse.  Bit 15 of the D.O. is connected to the L inputs on the interface
C  and bit 16 is connected to the R inputs.  Also, DODATA is set equal to
C  the mask (i.e.: a 1 in bit 15 and 16 to be sent).
      DIMASK = "30000
      DOMASK = "140000
      DODATA = DOMASK
C
C  Zero the clock.
C
      CALL CLOCKB(,,,IERR)
C
C  Goose the D.I. by sending it a positive going pulse from D.O.
C  Wait for the response.
C
63    CALL DOUT(0,DOMASK,IERR,"0)
      CALL DOUT(0,DOMASK,IERR,DODATA)
      IF(IDINP(0,DIMASK,IERR,DIDATA).EQ.0)GOTO 63
C
C  Make sure the finger has been raised.
```

```
C
61      CALL DOUT(0,DOMASK,IERR,"0)
        CALL DOUT(0,DOMASK,IERR,DODATA)
        IF(IDINP(0,DIMASK,IERR,DIDATA).NE.0)GOTO 61
C
        DO 215 J=1,80
           LIST(J)=' '
215     CONTINUE
C
95      LIST(81)="015
        OFLOW(81)="015
        LIST(82)="012
        OFLOW(82)="012
        OVERFL=0
        MM=0
        ITITE=1
C
C  Presentation and test routine.
C
        DO 40 I=1,JJ
C
C  Title routine.
C
        IF(IFLAG.EQ.1)GOTO 200
        IF(MM.EQ.0.OR.MM.EQ.16.OR.MM.EQ.32.OR.MM.EQ.48)GOTO 202
        GOTO 206
200     IF(MM.EQ.0.OR.MM.EQ.20.OR.MM.EQ.40.OR.MM.EQ.60)GOTO 202
```

```
      GOTO 206
202   IERR=MTOUT(2,MOVEC,8)
      IERR=MTOUT(2,ERASE,4)
      IF(ITEXT(ITITE).NE.1)GOTO 203
      DO 210 J=1,22
         LIST(J)=TITL1(J)
210   CONTINUE
C
203   IF(ITEXT(ITITE).NE.2)GOTO 204
      DO 211 J=1,26
         LIST(J)=TITL2(J)
211   CONTINUE
C
204   IF(ITEXT(ITITE).NE.3)GOTO 205
      DO 212 J=1,19
         LIST(J)=TITL3(J)
212   CONTINUE
C
205   IF(ITEXT(ITITE).NE.4)GOTO 220
      DO 213 J=1,42
         LIST(J)=TITL4(J)
213   CONTINUE
C
220   IF(IFLAG.EQ.0)GOTO 221
      PAUSE 'Push return for title.'
      II=ITTOUR("007)  -
      CALL CLOCKB(,,,IERR)
```

```
222     IF(ICLOKB().LE.500)GOTO 222
C
221     CALL DOUT(0,"1,IERR,"1)
        IERR=MTOUT(2,LIST,82)
        CALL DOUT(0,"1,IERR,"0)
207     CALL DOUT(0,DOMASK,IERR,"0)
        CALL DOUT(0,DOMASK,IERR,DODATA)
        IF(IDINP(0,DIMASK,IERR,DIDATA).NE.0)GOTO 207
        CALL DOUT(0,DOMASK,IERR,"0)
        CALL DOUT(0,DOMASK,IERR,DODATA)
208     IF(IDINP(0,DIMASK,IERR,DIDATA).EQ.0)GOTO 208
        ITITE=ITITE+1
C
        DO 214 J=1,80
          LIST(J)=' '
214     CONTINUE
C
C   Check to see if the line overflows.  If it does, put in OFLOW,
C   set flag OVERFL, read next line.
C
206           IF(TEXT(I,80).NE.'<')GOTO 88
              TEXT(I,80)='<'
              DO 86 K=1,70
                OFLOW(K)=TEXT(I,K)
 86           CONTINUE
              OVERFL=1
              GOTO 40
```

```
C
C  If the line does not overflow (either a single line or the
C  second line of a two line sentence), put in LIST.
C
   88          DO 30 K=1,70
                  LIST(K)=TEXT(I,K)
   30          CONTINUE
C
C  Routine for experimenter controlled warnings.
C
          MM=MM+1
          TYPE*,' TRIAL',MM
C
C  If single line, write to remote terminal in this routine.
C  Then go to timing routine.
C
       IF(OVERFL.EQ.1)GOTO 89
          IERR=MTOUT(2,MOVEC,8)
          IERR=MTOUT(2,ERASE,4)
C
C  Routine for experimenter controlled warnings, test only.
C
          IF(IFLAG.EQ.0)GOTO 91
          PAUSE 'Push return for trial'
          II=ITTOUR("007)
          CALL CLOCKB(,,IND)
   65     IF(ICLOKB().LE.500)GOTO 65
```

```
C
C  Resume writing.
C
91          CALL DOUT(0,"1,IERR,"1)
          IERR=MTOUT(2,LIST,82)
C
C  Wait for scanner to be at top left on screen.
C
92        IF(IDINP(0,"1,IERR,INPUT).EQ.1) GO TO 92
          CALL DOUT(0,"1,IERR,"0)
          CALL CLOCKB(,,,IERR)
          GOTO 67
C
C  If double line, write and go to timing routine.
C
 89     IERR=MTOUT(2,MOVEC,8)
        IERR=MTOUT(2,ERASE,4)
C
C  Routine for experimenter controlled warnings, test only.
C
        IF(IFLAG.EQ.0)GOTO 112
        PAUSE 'Push return for trial.'
        II=ITTOUR("007)
        CALL CLOCKB(,,,IND)
113     IF(ICLOKB().LE.500)GOTO 113
C
C  Resume writing routine.
```

```
C
112       CALL DOUT(0,"1,IERR,"1)
          IERR=MTOUT(2,OFLOW,82)
          IERR=MTOUT(2,LIST,82)
93        IF(IDINP(0,"1,IERR,INPUT) .EQ. 1) GO TO 93
          CALL DOUT(0,"1,IERR,"0)
          CALL CLOCKB(,,,IERR)
C
C  Make sure finger is up, goosing the D.I. each time.
C
67          CALL DOUT(0,DOMASK,IERR,"0)
            CALL DOUT(0,DOMASK,IERR,DODATA)
            IF(IDINP(0,DIMASK,IERR,DIDATA).NE.0)GOTO 67
C
C  Wait for response, without the goose.
C
            CALL DOUT(0,DOMASK,IERR,"0)
            CALL DOUT(0,DOMASK,IERR,DODATA)
62            IF(IDINP(0,DIMASK,IERR,DIDATA).EQ.0)GOTO 62
C
C  Increment index for time array and store time and response.
C
          ITIME(MM) = ICLOKB()
          FIRST=DIDATA/4096
          IRESP(MM)=FIRST-1
C
C  If line is an overflower, fill array to indicate at printout.
```

```
C
      IF(OVERFL.NE.1)GOTO 27
      OVERX(MM)='X'
      OVERFL=0
C
C  Blank output arrays and continue to next sentence.
C
27    DO 33 J=1,80
        LIST(J)=' '
        OFLOW(J)=' '
33    CONTINUE
40    CONTINUE
C
C  The subject is told the session is over.
C
      IERR=MTOUT(2,ERASE,4)
      IERR=MTOUT(2,MOVEC,8)
      DO 72 I=1,80
        LIST(I)=' '
72    CONTINUE
      DO 71 I=1,26
        LIST(I)=END(I)
71    CONTINUE
      CALL DOUT(0,"1,IERR,"1)
      IERR=MTOUT(2,LIST,82)
      CALL DOUT(0,"1,IERR,"0)
C
```

```
C  The condition, sentence number, and reading time is written to the
C  subject's output file.  If this is the presentation as indicated by
C  FLAG, the time each sentence is on screen is written to file
C  BG1S*.ACQ, if it's the test, response (old or new) is written to
C  file BG1S*.TST.
C
      KK=0
      IDX=1
      DO 90 I=1,MM
66      IF(IFLAG.EQ.1)GOTO 58
        KK=KK+1
        IF(KK.NE.17)GOTO 23
        KK=1
        IDX=IDX+1
23      WRITE(16,140)ISUB1,ISUB2,I,(CELLOUT(KK,II),II=1,3),
     &  (ICELNO(KK,II),II=1,3),ITEXT(IDX),ISTOUT(KK),ITIME(I),
     &  OVERX(I)
140     FORMAT(2I1,1X,I2,1X,3A1,1X,3I1,1X,I1,1X,I3,I5,1X,A1)
        GOTO 90
58      KK=KK+1
        IF(KK.NE.21)GOTO 60
        KK=1
        IDX=IDX+1
60      WRITE(16,141)ISUB1,ISUB2,I,(CELL(KK,II),II=1,3),
     &  (ISELNO(KK,II),II=1,3),ITEXT(IDX),ITST(KK),ITIME(I),IRESP(I),
     &  OVERX(I)
141     FORMAT(2I1,1X,I2,1X,3A1,1X,3I1,1X,I1,1X,I3,I5,I5,1X,A1)
```

```
90      CONTINUE
C
C
        IF(IFLAG.EQ.1)GOTO 59
C
C   Test phase.
C
C   File that will hold responses is opened.
C
        IFLAG=1
        FIRST=1
        CLOSE(UNIT=16)
        CLOSE(UNIT=LUNA)
        REWIND 17
        ENAME(5)=ALPHA(ISUB1+1)
        ENAME(6)=ALPHA(ISUB2+1)
        OPEN(UNIT=16,NAME=ENAME,TYPE='NEW')
C
C   Array that will hold all test sentences is blanked.
C
        DO 50 I=1,90
            DO 50 J=1,80
                TEXT(I,J)=' '
50      CONTINUE
C
C   As in the presentation routine, each sentence of the master stim
C   file is read in, those with statement numbers matching the numbers
```

```
C   in the test part of the version matrix, are written to TEXT array.
C   Overflow lines are indicated the same way.
C
      JJ=0
      DO 51 I=1,4
52      READ(17,101)TXNO,STNO,NCHARS,(LIST(K),K=1,NCHARS)
        IF(TXNO.NE.ITEXT(I))GOTO 52
        DO 53 J=1,20
55        IF(STNO.EQ.ITST(J))GOTO 54
          READ(17,101)TXNO,STNO,NCHARS,(LIST(K),K=1,NCHARS)
          GOTO 55
54        JJ=JJ+1
          DO 56 K=1,NCHARS
            IF(LIST(K).EQ.'<')GOTO 53
            TEXT(JJ,K)=LIST(K)
56        CONTINUE
          TEXT(JJ,80)='<'
          READ(17,101)TXNO,STNO,NCHARS,(LIST(K),K=1,NCHARS)
          GOTO 54
53      CONTINUE
        REWIND 17
51    CONTINUE
      GOTO 57
C
C   At the end of the routine storing the test sentences, the program
C   loops back to the same routine used in presentation.
C
```

```
59      IERR=MTDTCH(2)
        STOP
        END
```

APPENDIX K

Tables of Results

Table 1.

Mean Ratings on the Three Experimental Dimensions for General and Specific Sentences used in Experiment 1.

	Sentence Type	
Rating	General	Specific
Typicality	6.133	5.668
	(0.765)	(0.723)
Relevance	5.693	5.378
	(0.803)	(0.731)
Specificity	3.260	4.316
	(0.973)	(0.979)

Note 1: Numbers in parenthesis are standard deviations; number of sentences per mean is 128.

Table II.

Reading Time per Word in Milliseconds for the Dimensions of Activity by Specificity in Experiment 1

	General	Specific
Restaurant	311	305
Moving	324	309
Wedding	275	268
Flying	330	285

Table III.

Percent Correct Responses for the Dimensions of Test by Prime Type in Experiment 1.

	General	Specific
Identical	68.36	72.27
General	46.48	86.33
Specific	61.33	76.95
None	81.64	92.97

Table IV.

Percent Yes Responses for the Dimensions of Test by Prime Type in Experiment 1.

	General	Specific
Identical	68.36	72.27
General	53.52	13.67
Specific	38.67	23.05
None	18.36	7.03

Table V.

D - Primes of the Dimensions of Type of Priming by Specificity of Test Sentence in Experiment 1.

	General	Specific
None	1.80	2.53
Same	0.45	1.70
Different	1.10	1.94

Table VI.

Correct Response Time in Seconds for the Dimensions of Test by Prime Type in Experiment 1.

	General	Specific
Identical	2.32	2.53
General	2.76	2.73
Specific	2.46	2.67
None	2.31	2.39

Table VII.

Mean Ratings on the Three Experimental Dimensions for The Relevance by Typicality Conditions in Experiment 2.

	Relevant Typical	Relevant Atypical	Irrelevant Typical	Irrelevant Atypical
Typicality	5.76	2.56	4.99	2.45
	(0.74)	(0.79)	(0.73)	(0.73)
Relevance	5.47	5.18	2.62	2.36
	(0.72)	(0.73)	(0.71)	(0.75)
Specificity	4.20	4.75	4.17	4.76
	(0.95)	(0.78)	(0.80)	(0.82)

Note 2: Numbers in parentheses are standard deviations; number of sentences per mean is 24.

Table VIII.

Reading Time per Word in Milliseconds in Experiment 2.

	Restaurant		Moving	
	Relevant	Irrelevant	Relevant	Irrelevant
Typical	316	277	294	277
Atypical	316	275	290	302

	Wedding		Flying	
	Relevant	Irrelevant	Relevant	Irrelevant
Typical	267	326	285	304
Atypical	289	351	311	301

Table IX.

Percent Correct Responses for the Dimensions of Relevance by Typicality by Target/Distractor in Experiment 2.

	Relevant	
	Target	Distractor
Typical	74.22	88.28
Atypical	80.73	96.10

	Irrelevant	
	Target	Distractor
Typical	76.04	95.05
Atypical	84.12	95.83

Table X.

Percent Yes Responses for the Dimensions of Relevance by Typicality by Target/Distractor in Experiment 2.

	Relevant	
	Target	Distractor
Typical	74.22	11.72
Atypical	80.73	3.90

	Irrelevant	
	Target	Distractor
Typical	76.04	4.95
Atypical	84.12	4.17

Table XI.

D - Primes for the Dimensions of Typicality by Relevance by Activity in Experiment 2.

	Restaurant		Moving	
	Typical	Atypical	Typical	Atypical
Relevant	2.98	3.57	2.10	3.27
Irrelevant	3.00	3.56	3.38	3.34

	Wedding		Flying	
	Typical	Atypical	Typical	Atypical
Relevant	2.76	3.64	3.00	3.64
Irrelevant	2.77	3.59	3.59	4.10

Table XII.

Correct Response Time in Seconds for the Dimensions of Typicality by Relevance by Target/Distractor in Experiment 2.

	Relevant	
	Target	Distractor
Typical	2.44	2.47
Atypical	2.26	2.29

	Irrelevant	
	Target	Distractor
Typical	2.24	2.18
Atypical	2.43	2.22

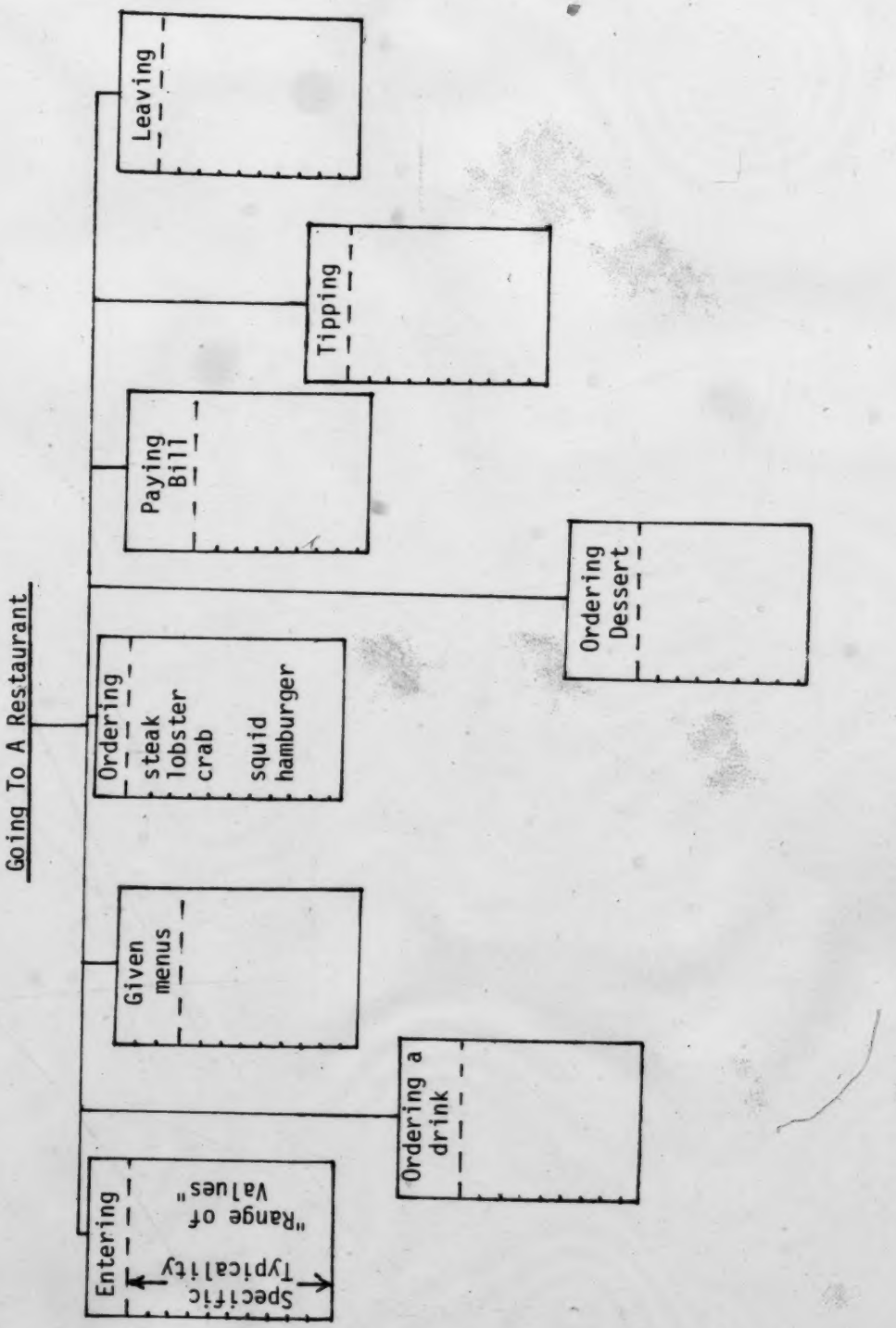

Figure 1. Semantic Memory Representation of a Schema.

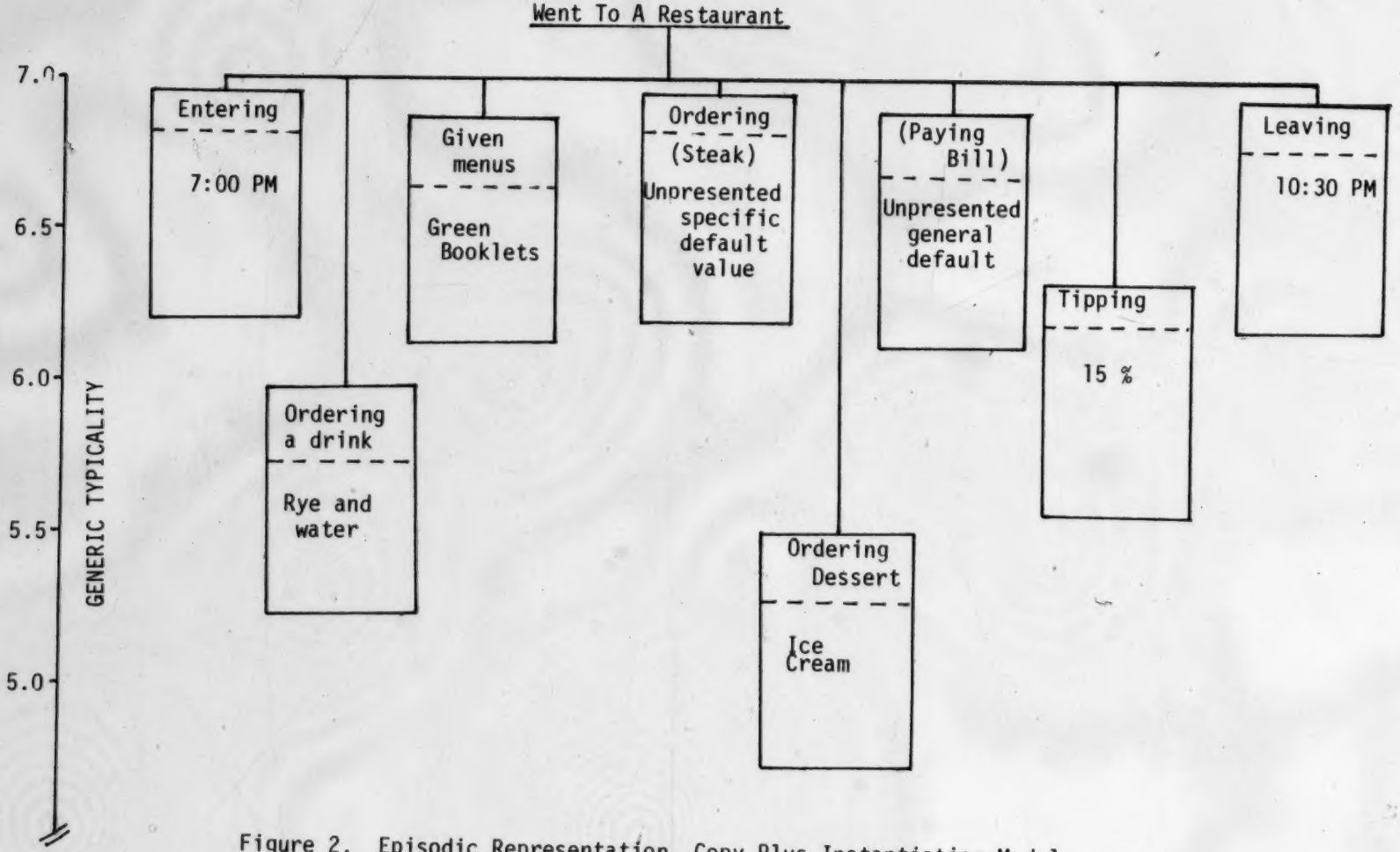

Figure 2. Episodic Representation, Copy Plus Instantiation Model